ECONOMIC ANALYSIS OF THE FINAL RULE TO MODIFY REPORTING OF LEAD AND LEAD COMPOUNDS UNDER EPCRA SECTION 313

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NOTE

This document is not intended to serve as official guidance and should not be relied upon to determine applicable regulatory requirements. This document was prepared to provide economic information for the rulemaking process, and to meet various administrative and legislative requirements. Due to the nature of the information available to EPA, the document contains various assumptions that may not reflect the reporting determinations that an individual facility would make, were it to apply the reporting requirements to its specific processes and circumstances.

Persons seeking information on regulatory requirements as they apply to specific facilities should consult 40 CFR Part 372; the preambles for regulatory actions implemented under section 313 of the Emergency Planning and Community Right-to-Know and section 6607 of the Pollution Prevention Act; EPA's "Toxic Chemical Release Inventory Reporting Forms and Instructions"; guidance documents that EPA has published for specific chemicals and industries; and the Emergency Planning and Community Right-to-Know Information Hotline.

CONTRIBUTORS

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SUMMARY

S.1 INTRODUCTION

Under section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA), and section 6607 of the Pollution Prevention Act (PPA), certain facilities are required to file annual reports to the United States Environmental Protection Agency (EPA) and to states on their releases, transfers, and other waste management practices for certain toxic chemicals if they are manufactured, processed, or otherwise used above certain threshold amounts. This information is included in a publicly available database known as the Toxic Release Inventory (TRI).

The reporting thresholds under section 313(f)(1) of EPCRA are 25,000 pounds for chemicals that are manufactured or processed and 10,000 pounds for chemicals that are otherwise used. Certain persistent bioaccumulative toxic chemicals have lower reporting thresholds of 10 or 100 pounds. Section 313(f)(2) authorizes EPA to revise these reporting thresholds. Under the final rule, EPA is lowering the reporting thresholds for lead and lead compounds to 100 pounds, based on their persistence and bioaccumulation in the environment.

S.2 NEED FOR THE RULE

For certain chemicals, such as those that persist in the environment and bioaccumulate, important information about releases and other waste management activities may not be available to the public because facilities manufacture, process or otherwise use the chemicals at levels below the current TRI reporting thresholds. Since persistent bioaccumulative toxic (PBT) chemicals can remain in the environment for a significant amount of time and can accumulate in animal tissues, even relatively small releases of such chemicals from individual facilities may have significant adverse effects on human health and the environment. This situation results in a market failure. Markets fail to achieve socially efficient outcomes when differences exist between market values and social values. Two causes of market failure are externalities and information asymmetries.

In the case of negative externalities, the actions of one party impose costs on other parties that are “external” to any market transaction. For example, a facility may release toxic chemicals without accounting for the consequences to other parties, such as the surrounding community, and the prices of that facility’s goods or services will fail to reflect those costs.

The market may also fail to allocate resources efficiently in cases where consumers lack information. For example, when toxic release information is insufficient, individuals’ choices regarding where to live and work may not be the same as if they had more complete information.

Since firms ordinarily have little or no incentive to provide information on their releases and other waste management activities involving toxic chemicals, the market fails to allocate society's resources in the most efficient manner.

Federal regulations exist, in part, to address significant market failures. In cases where the market is unlikely to provide adequate information, public intervention can provide consumers and possibly producers with information that will allow them to make better decisions. The final rule addresses the market failures arising from private choices about lead and lead compounds that have societal costs, and the market failures created by the limited information available to the public about the releases and other waste management of lead and lead compounds.

Certain facilities currently report TRI data on lead and lead compounds under the existing 10,000- and 25,000-pound reporting thresholds. The final rule addresses additional facilities that do not currently report lead and lead compounds to TRI because they do not exceed current reporting thresholds for lead and lead compounds, and/or because the lead-containing materials they handle are currently covered by the *de minimis* exemption.

S.3 ACTIONS UNDER THE FINAL RULE

EPA is lowering reporting thresholds for lead and lead compounds, based on their persistence and bioaccumulation in the environment. This action is described below in more detail.

S.3.1 LOWER REPORTING THRESHOLDS

The regulatory options that EPA evaluated were created by varying the reporting thresholds from their current levels of 25,000 pounds for manufacture and processing, and 10,000 pounds for otherwise use of EPCRA section 313 chemicals. EPA considered the following options for reporting of lead and lead compounds to TRI:

- **Option 1.** Reporting threshold of 1 pound of lead and/or lead compounds manufactured, processed or otherwise used.

- **Option 2.** Reporting threshold of 10 pounds lead and/or lead compounds manufactured, processed or otherwise used.

- **Option 3.** Reporting threshold of 100 pounds lead and/or lead compounds manufactured, processed or otherwise used. This is the selected option presented in the regulatory text.

- **Option 4.** Reporting threshold of 1,000 pounds lead and/or lead compounds manufactured, processed or otherwise used.

S.3.2 OTHER ACTIONS

EPA is making a number of other modifications to the reporting of lead and lead compounds beyond the lowering of reporting thresholds.

De Minimis Exemption

For lead and lead compounds, EPA is eliminating the *de minimis* exemption. The current reporting requirements allow facilities to disregard certain low concentrations of chemicals in mixtures or other trade name products in making threshold determinations for TRI reporting. This *de minimis* exemption applies to mixtures and trade name products that are imported, manufactured as an impurity, processed, or otherwise used.

Alternate Threshold and Form A

EPA is requiring facilities to file a Form R report when they meet reporting criteria for lead and lead compounds with lower reporting thresholds. Current reporting rules allow facilities to file a Form A instead of a Form R if they have less than 500 pounds of production-related waste of a listed toxic chemical and do not manufacture, process, or otherwise use more than one million pounds of that listed toxic chemical. The Form A is a certification statement; the release, transfer, and waste management information reported on the Form A is more limited than that provided by the Form R.

Range Reporting

EPA is requiring facilities to report numerical values for releases and off-site transfers for waste management of lead and lead compounds. EPA currently allows facilities to use range codes in reporting less than 1,000 pounds of releases and off-site transfers for further waste management.

Half-pound Rule and Whole Number Reporting

For lead and lead compounds, EPA is requiring that all releases or other waste management quantities of greater than a tenth of a pound be reported, provided that the appropriate activity threshold has been exceeded and provided that the accuracy and underlying data support this level of precision. EPA is also requiring that for release and other waste management quantities less than ten pounds, fractional quantities (*e.g.*, 6.2 pounds) rather than whole numbers be reported. EPA currently requires that facilities report numerical quantities as whole numbers. EPA also currently allows facilities to round releases of 0.5 pounds or less to zero.

For lead and lead compounds, if the facility's release or other waste management estimates support reporting an amount that is more precise than whole numbers and two significant digits, then the facility should report the more precise amount. If the data and/or estimation techniques do not support this degree of accuracy, then the facility's estimates are not required to be reported to a greater degree of accuracy than is available.

Reporting Limitation for Lead in Alloys

Lead can be found in various types of alloys used at facilities that are subject to reporting under section 313. EPA is limiting the reporting for lead by excluding brass, bronze, or stainless steel alloys that contain the metal from the lower reporting thresholds and release and waste management calculations. Under this limitation, once incorporated into a brass, bronze, or stainless steel alloy, lead would not be reportable at the lower reporting threshold. Cutting, grinding, shaving, and other activities involving a brass, bronze, or stainless steel alloy that contains lead would not be reportable at the lower threshold, although the lead used in the manufacture of these same alloys would be reportable at the lower threshold.

S.4 ESTIMATED REPORTING ACTIVITY

In 1998, EPA received TRI data on the release and other waste management of over a billion pounds of lead and lead compounds from approximately 1,900 facilities. The industry groups reporting the largest amounts of release or other waste management of lead and lead compounds in 1998 were Primary metal industries (SIC 33); Electronic and other electrical equipment and components, except computer equipment (SIC 36); Metal mining (SIC 10); Stone, clay, glass, and concrete products (SIC 32); and Refuse systems (SIC 4953).

The numbers of additional TRI reports for lead and lead compounds under four regulatory options are summarized in Table S-1. Under Option 3, the selected option as presented in the regulation text, approximately 10,000 additional reports on lead and lead compounds are predicted as a result of the rule. Approximately 24 percent of these reports are triggered by the consumption of fuel (primarily coal and residual fuel oil) at manufacturing facilities and electric utilities. These fuels contain lead and lead compounds. Facilities that use sufficient amounts of fuel may exceed the lower reporting threshold.

TABLE S-1
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD & LEAD COMPOUNDS

SIC Code - Industry Group	Number of Reports (Annual)			
	Option 1	Option 2	Option 3 (Selected)	Option 4
10 — Metal mining (except 1011, 1081, 1094)	127	127	127	127
12 — Coal mining (except 1241)	314	314	314	314
20 — Food and kindred products	1,337	1,110	291	120
24 — Lumber and wood products except furniture	2,167	860	107	17
28 — Chemicals and allied products	945	652	497	360
33 — Primary metal industries	2,182	2,182	1,945	1,044
36 — Electronic and other electrical equipment and components, except computer equipment	4,008	3,998	3,501	1,483
20-39 **-** Other manufacturing or industrial combustion	7,177	3,563	1,656	792
4911—Electric services (coal and oil facilities only)	356	335	301	258
4931—Electric & other services (coal and oil facilities only)	275	264	246	224
4939—Combination utilities (coal and oil facilities only)	30	29	27	24
4953 — Refuse systems	107	107	107	107
5171 — Bulk petroleum	2,454	975	616	50
7389 — Solvent recovery services	108	96	78	40
Total	**21,587**	**14,612**	**9,813**	**4,960**

S.5 COSTS OF THE RULE

The rule will result in the expenditure of resources that, in the absence of the regulation, could be used for other purposes. The cost of the rule is the value of these resources in their best alternative use. Most of the costs of the rule result from requirements on industry.

S.5.1 PRIVATE INDUSTRY COSTS

To estimate the industry costs of compliance, the unit cost for each task that a subject facility may be required to perform as a result of the rule is multiplied by the relevant number of facilities or reports associated with that task. Table S-2 displays the industry costs for each regulatory option based on the estimated number of facilities affected and the estimated number of additional reports.

Under the option presented in the regulation text (Option 3), approximately 10,000 facilities will submit additional Form R reports annually. As shown, aggregate industry costs in the first year for this alternative are estimated to be $80 million; in subsequent years they are estimated to be $40 million per year. Industry costs are lower after the first year because facilities will be familiar with the reporting requirements, and many will be able to expedite reporting by updating or modifying information from the previous year's report.

TABLE S-2
SUMMARY OF REPORTING AND ASSOCIATED COST TO INDUSTRY

Regulatory Options	Annual Number of Reporting Facilities	Estimated Industry Costs (million $ per year)	
		First Year	Subsequent Years
Option 1	21,587	183	89
Option 2	14,612	121	60
Option 3 (Selected Option)	9,813	80	40
Option 4	4,960	38	20

S.5.2 COSTS TO PUBLICLY OWNED FACILITIES

There are an estimated 13 publicly-owned coal- and oil-fired electric utility plants that will be affected by the rule. Under Option 3, 8 of these facilities are estimated to submit a total of 8 reports at a cost of approximately $42,000 in the first year and $29,000 in subsequent years. These costs are reflected in the estimated industry costs shown in Table S-2.

S.5.3 EPA Costs

EPA will incur costs as a result of the rule. These costs include costs for data processing, outreach and training, information dissemination, policy and petitions, and compliance and enforcement. Under Option 3, EPA is expected to expend $1.2 million in the first year, and $775,000 in subsequent years as a result of the rule.

S.5.4 Summary of Costs

The estimated total cost of the final rule is $81 million in the first year and $41 million in subsequent years. Table S-3 summarizes the total costs to industry and EPA of the rule.

TABLE S-3
SUMMARY OF TOTAL COSTS OF FINAL RULE (Option 3)

DESCRIPTION	First Year (million $)	Subsequent Years (million $)
Industry Costs	$80	$40
EPA Costs	$1.2	$0.8
TOTAL COSTS	**$81**	**$41**

S.6 IMPACTS OF THE FINAL RULE

S.6.1 Impacts on Small Entities

The final rule may affect both small businesses and small governments. No small organizations are expected to be affected by the final rule. For analytical purposes, EPA defined a “small” business using the small business size standards established by the Small Business Administration (SBA). The SBA small business size standards are expansive, classifying most businesses as “small.” (For example, the SBA size standard is 500 employees for approximately 75 percent of the manufacturing industries, and either 750, 1,000 or 1,500 for the remaining manufacturing industries, which would mean that more than 98.5 percent of all manufacturing firms are classified as small businesses.) EPA defined “small” governments using the RFA definition of jurisdictions with a population of less than 50,000. Only those small entities that are expected to submit at least one report are considered to be affected for the purpose of the small entity analysis. The number of affected entities will be smaller than the number of affected facilities, because some entities operate more than one facility.

Small Businesses

This analysis uses annual compliance costs as a percentage of annual company sales to assess the potential impacts of the rule on small businesses. This is a good measure of a firm's ability to afford the costs attributable to a regulatory requirement, because comparing compliance costs to revenues provides a reasonable indication of the magnitude of the regulatory burden relative to a commonly available and stable measure of a company's business volume. Where regulatory costs represent a small fraction of a typical firm's revenue, the financial impacts of the regulation are likely to be minimal.

For the first reporting year, 3,829 potentially affected small businesses are estimated to bear annual compliance costs of less than 1 percent of revenues, 239 small businesses are estimated to bear annual costs between 1 and 3 percent of revenues, and no small businesses are estimated to bear annual costs greater than 3 percent of annual revenues. In subsequent years, all 4,068 small businesses are predicted to face annual compliance costs of less than 1 percent of annual revenues, and no small businesses are estimated to bear annual costs greater than 1 percent of annual revenues. Impact percentages based on annual costs after the first year are the best measure to judge the impacts on small entities because these continuing costs are more representative of the costs firms face to comply with the final rule.

Small Governments

It is estimated that 13 publicly-owned electric utility facilities, operated by a total of 13 municipalities, may be affected. Of these, an estimated 7 are operated by small governments (i.e., those with populations under 50,000). To assess the potential impacts on small governments, EPA used annual compliance costs as a percentage of the utility's annual revenues to measure potential impacts. Similar to the methodology for small businesses, this measure was used because it provides a reasonable indication of the magnitude of the regulatory burden relative to a government's ability to pay for the costs, and is based on readily available data. None of the 7 small government-owned utilities are estimated to bear costs greater than 1 percent of annual revenues in either the first or subsequent reporting years.

S.6.2 IMPACTS ON CERTAIN DEMOGRAPHIC GROUPS

By lowering the section 313 reporting thresholds for lead and lead compounds, EPA will provide communities across the United States (including low-income populations and minority populations) with access to data that may assist them in lowering exposures and consequently reducing chemical risks for themselves and their children. This information can also be used by government agencies and others to identify potential problems, set priorities, and take appropriate steps to reduce any potential risks to human health and the environment. Therefore, the informational benefits of the final rule will have a positive effect on the human health and environment of minority populations, low-income populations, and children.

S.7 BENEFITS OF THE FINAL RULE

In enacting EPCRA and PPA, Congress recognized the significant benefits of providing information on the presence, release, and waste management of toxic chemicals. TRI has proven to be one of the most powerful forces empowering the federal government, state and local governments, industry, environmental groups, and the general public to fully participate in an informed dialogue about the environmental impacts of toxic chemicals in the United States. TRI enables interested parties to establish credible baselines, to set realistic goals for environmental progress over time, and to measure progress in meeting these goals. The TRI system is a neutral yardstick by which progress can be measured.

This rule to expand reporting on lead and lead compounds is intended to build upon past success of TRI. Under current reporting thresholds, important information about the releases and other waste management activities involving lead and lead compounds is not being captured by the TRI. By lowering reporting thresholds for lead and lead compounds, EPA will assure that the public will have access to such data.

The benefits of the final rule are related to the provision and distribution of additional information on lead and lead compounds, and include improvements in understanding, awareness, and decision-making. The information reported to TRI increases knowledge of the levels of pollutants released to the environment and the potential pathways of exposure, thereby improving scientific understanding of the health and environmental risks of toxic chemicals; allowing the public to make better-informed decisions on matters such as where to work and live; enhancing the ability of corporate leaders and purchasers to gauge a facility's potential environmental liabilities; and assisting federal, state, and local authorities in making better decisions on acceptable levels of toxic chemicals.

Moreover, providing information can lead to follow-on activities that create additional costs and benefits. These follow-on activities, including reductions in releases of and changes in the waste management practices for toxic chemicals, yield health and environmental benefits. These changes in behavior come at some cost, and the net benefits of the follow-on activities are the difference between the benefits of decreased chemical releases and transfers and the costs of the actions needed to achieve the decreases.

Because the state of knowledge about the economics of information is not highly developed, EPA has not attempted to quantify or monetize the benefits of changing reporting thresholds for lead and lead compounds. Furthermore, because of the inherent uncertainty in the subsequent chain of events, EPA has also not attempted to predict the changes in behavior that result from the information, or the resultant net benefits, (i.e., the difference between benefits and costs). EPA's benefit analysis, however, does illustrate how the final rule will improve the availability of information on lead and lead compounds.

CHAPTER 1
BACKGROUND, STATEMENT OF NEED, STATUTORY AUTHORITY AND OVERVIEW OF ANALYSIS

The Emergency Planning and Community Right-to-Know Act (EPCRA) created a broad range of emergency response planning and reporting requirements for manufacturers, processors, and users of toxic chemicals in the United States. Under section 313 of EPCRA, certain facilities are required to submit annual reports to the United States Environmental Protection Agency (EPA) and to States on their release(s), transfer(s), and waste management activities for certain toxic chemicals if they are manufactured, processed, or otherwise used above thresholds amounts. In addition, the Pollution Prevention Act (PPA) of 1990 requires these same facilities to report prevention, recycling, and other waste management information for these same chemicals. EPA maintains the data collected under EPCRA section 313 and the PPA in a database known as the Toxic Release Inventory (TRI).[1]

EPCRA section 313(f)(1) contains default reporting thresholds for facilities. These reporting thresholds are 25,000 pounds for toxic chemicals that are manufactured (including imported) or processed, and 10,000 pounds for toxic chemicals that are otherwise used. Facilities that meet these reporting thresholds, as well as other reporting criteria, are required to submit annual reports. EPA has determined that lower reporting thresholds are appropriate for lead and lead compounds because these chemicals persist and bioaccumulate in the environment. In addition, EPA is enacting other modifications to ensure meaningful reporting of lead and lead compounds.

This report analyzes the economic effects of modifying EPCRA section 313 reporting requirements for lead and lead compounds. To understand the effects of the final rule, however, it is first necessary to understand how EPCRA section 313 and TRI currently operate. This chapter provides a description of the statutory and regulatory history of TRI, followed by a summary of the TRI reporting requirements and how the data have been used. The chapter concludes with a description of the need for TRI, and the statutory authority for expanding the program.

[1] The term *EPCRA section 313* properly refers to only the statutory requirements, while the term *TRI* properly refers to the database where the information collected under section 313 and under section 6607 of the PPA is stored. However, the terms have often been used interchangeably by the public to refer to the statute, the regulatory requirements, the reporting form, the database, and EPA's program to manage the data. In deference to common usage, the terms EPCRA section 313 and TRI are sometimes used interchangeably in this report where doing so will make the report simpler and easier to read.

1.1 STATUTORY AND REGULATORY HISTORY

1.1.1 PASSAGE OF EPCRA

In 1986, Congress enacted EPCRA. The law was enacted in response to the accidental release of methyl isocyanate gas in Bhopal, India in December, 1984, and a number of chemical accidents in the U.S., including one in Institute, West Virginia. These accidental releases highlighted the dearth of information available to the public about toxic chemicals being manufactured, processed, used and transported within communities. EPCRA is based on the premise that the public has the right to know about chemical uses, as well as routine and accidental releases. The broad purposes are to encourage planning for response to accidental chemical releases as well as daily management of routine releases, and to provide the public and government agencies with information about the presence, release, and management of toxic chemicals.

EPCRA contains four main provisions:

- Planning for chemical emergencies (sections 301-303),
- Emergency notification of chemical accidents and releases (section 304),
- Reporting of hazardous chemical inventories (sections 311-312), and
- Toxic chemical release reporting (section 313).

Because the rule is being promulgated under section 313 (and not the other sections of EPCRA), the remainder of this overview deals only with section 313 (i.e., TRI).

1.1.2 OVERVIEW OF TRI

The initial regulations implementing EPCRA section 313 were promulgated on February 16, 1988 (53 FR 4500) and are codified at 40 CFR Part 372. Under these regulations, owners or operators of covered facilities must complete the Toxic Chemical Release Inventory Reporting Form R, which includes information on releases to air, water and land, as well as on-site waste treatment and transfers of the chemical in or as waste to off-site locations. These reports must be submitted to EPA and the States for each calendar year, by July 1 of the following year.

A completed Form R must be submitted for each toxic chemical manufactured, processed, or otherwise used at each covered facility as described in 40 CFR Part 372. There are currently over 600 toxic chemicals and chemical compound categories on the list of EPCRA Section 313 chemicals.

A facility must report under section 313 if it meets all three of the following criteria:

(1) It is in a Standard Industrial Classification (SIC) code covered by the regulations;

(2) It has 10 or more full-time employees (or the hourly equivalent of 20,000 hours); and

(3) It manufactures, processes, or otherwise uses any of the listed toxic chemicals or chemical categories above the applicable reporting threshold.

TRI is unique among environmental databases because of the multimedia data it collects, and because it was designed for public access. EPCRA requires that EPA "establish and maintain in a computer database a national toxic chemical inventory based on data submitted to the Administrator." The Administrator shall make the data available by computer, telecommunication, and other means to any person on a cost reimbursable basis. EPA maintains the section 313 data in the national Toxic Release Inventory (TRI) database. TRI data are available to the public in a variety of paper and electronic formats, including disk, on-line, and CD-ROM.

Section 313(h) of EPCRA states that data obtained pursuant to section 313 are intended to provide information to the public as well as to Federal, State, and local governments. "These data shall be used to inform the public about releases to the environment of the listed chemicals; to assist government agencies, researchers, and other persons conducting research and gathering data; to aid in the development of appropriate regulations, guidelines, and standards; and for other similar purposes."

1.1.3 POLLUTION PREVENTION ACT

In 1990, Congress enacted the Pollution Prevention Act (PPA), adopting as national policy an environmental hierarchy establishing pollution prevention as the first choice among waste management options. For waste that cannot be prevented at the source, recycling is considered the next best option. Treatment or disposal should be turned to only after source reduction and recycling have been considered. Section 6607 of the PPA augmented the information available to the public under EPCRA section 313 by requiring facilities to report information on their pollution prevention, recycling, and other waste management activities on Form R. The data elements required by the Pollution Prevention Act are contained in section 8 of the Form R.

1.1.4 CHANGES TO THE LIST OF CHEMICALS

When Congress enacted EPCRA, it gave EPA an initial list of approximately 300 chemicals and chemical categories subject to TRI reporting. The statutory list was derived from chemical lists used in New Jersey and Maryland. Congress also included a provision in EPCRA to amend the list of chemicals. Under section 313(d), EPA has the authority to add a chemical to the list if it determines that the chemical can cause or can be reasonably anticipated to cause:

- Adverse acute human health effects at concentration levels reasonably likely to exist beyond facility site boundaries as a result of continuous or frequently recurring releases;
- Cancer or teratogenic effects, serious or irreversible reproductive dysfunctions, neurological disorders, heritable genetic mutations, or other chronic health effects; or
- A significant adverse effect on the environment.

EPA has also added chemicals to the list through its authority under section 313(d). Most notably, EPA added 286 chemicals and chemical categories to the list of toxic chemicals subject to TRI on November 30, 1994 (59 FR 61432). The majority of these chemicals are pesticides. Many of the remainder are chemicals regulated or identified as concerns under other environmental statutes such as the Clean Air Act, the Clean Water Act and the Safe Drinking Water Act.

EPA may delete a chemical from the list if it does not meet any of the above criteria. According to section 313(e) of EPCRA, any person may petition EPA to add or delete a chemical from the list on the basis of whether or not it meets the above criteria. All changes to the list are made through notice-and-comment rulemaking.

1.1.5 ALTERNATE THRESHOLD

On November 30, 1994, EPA finalized the "TRI Alternate Threshold for Facilities with Low Annual Reportable Amounts" (59 FR 61488). This rule was intended to reduce the compliance burden associated with EPCRA section 313. It established a streamlined reporting option for facilities where the annual reportable amount of a listed chemical released or managed does not exceed 500 pounds.[2] Such facilities have the option of applying an alternate manufacture, process, or otherwise use threshold of 1 million pounds to that chemical, instead of the standard thresholds of 10,000 or 25,000 pounds. If a facility does not exceed the 1 million-pound threshold, then that facility is eligible to submit Form A for that chemical instead of Form R.

Form A is a simplified reporting form that includes facility identification information and the identity of the chemical or chemical category being reported. The Form must be submitted on an annual basis, and the information appears in the TRI data base in the same manner as information submitted on a Form R.

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[2] The annual reportable amount is equal to the combined total quantities recycled, combusted for energy recovery, treated or released. It can be calculated as the sum of data elements 8.1 through 8.7 on Form R.

As described in Chapter 2, EPA is requiring reporting using only the Form R for lead and lead compounds.

1.1.6 EXECUTIVE ORDER 13148

Federal facilities have been subject to mandatory TRI reporting since 1994. Federal agencies are currently subject to EPCRA and PPA requirements through Executive Order 13148 entitled "Greening the Government Through Leadership in Environmental Management," which was signed on April 21, 2000. Federal agencies are required to comply with EPCRA section 313 reporting requirements without regard to the Standard Industrial Classification (SIC) or North American Industrial Classification System (NAICS) delineations. Besides encouraging federal facilities to "be leaders and responsible members of their communities by informing the public and their workers of possible sources of pollution resulting from facility operations," the executive order sets a goal of a 40 percent reduction in toxic chemical releases and off-site transfers for treatment and disposal by December 31, 2006 for each federal agency.

1.1.7 CHANGES TO THE LIST OF INDUSTRIES

On May 1, 1997, EPA added facilities in seven industry groups to the list of facilities subject to the reporting requirements of section 313 (62 FR 23833). Prior to this action, reporting was limited to facilities in the manufacturing sector (SIC codes 20-39) and federal facilities. This action added certain facilities in the following sectors:

- metal mining,
- coal mining,
- electric utilities,
- commercial hazardous waste treatment,
- chemicals and allied products-wholesale,
- petroleum bulk terminals and plants-wholesale, and
- solvent recovery services.

The first reports from these facilities were submitted in 1999 for reporting year 1998.

1.1.8 CHANGES FOR CERTAIN PBT CHEMICALS

On October 29, 1999, EPA lowered reporting thresholds to 10 or 100 pounds for certain TRI chemicals that are of concern because of their tendency to persist and bioaccumulate (64 FR 58666).[3] EPA added to TRI certain PBT chemicals that were not already listed. The Agency also made other concurrent changes in the program for PBT chemical reporting, such as eliminating the *de minimis* exemption, range reporting, and Form A reporting.

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[3] In this rule, EPA also created a category of dioxin and dioxin-like compounds and established a reporting threshold of 0.1 grams for this category.

1.2 SUMMARY OF TRI REPORTING REQUIREMENTS

The previous section described the fundamentals of TRI reporting. This section provides a brief overview of several key requirements under the current TRI regulations. These descriptions are for the purpose of general background and are not comprehensive. This is not an official guidance document and should not be relied upon to determine applicable regulatory requirements. More information on specific requirements is available in EPA's "Toxic Chemical Release Inventory Reporting Form and Instructions," the EPCRA Section 313 Question and Answer Document; or from the Emergency Planning and Community Right-to-Know Information Hotline.

1.2.1 DEFINITION OF A FACILITY

EPCRA section 329 defines a facility to mean "all buildings, equipment, structures and other stationary items which are located on a single site or on contiguous or adjacent sites and which are owned or operated by the same person."

1.2.2 FULL-TIME EMPLOYEE DETERMINATION

Facilities are only covered by TRI if they have 10 or more full-time employees (FTE) or the equivalent (20,000 hours, where a full-time employee is defined as 2,000 work hours per year). All employees, including part-time and contract employees, must be counted in the FTE determination. Therefore, the FTE determination depends on the total number of hours worked during the year, and not on the actual number of persons working.

1.2.3 THRESHOLD DETERMINATIONS

Facilities must report to TRI if they manufacture, process, or otherwise use any of the listed chemicals above the reporting thresholds. For chemicals manufactured or processed the current threshold is 25,000 pounds a year; for chemicals that are otherwise used, the current threshold is 10,000 pounds a year. For certain PBT chemicals, the applicable reporting thresholds are 10 or 100 pounds, depending on the degree of persistence and bioaccumulation of the toxic chemical.[4] Threshold determinations for chemicals that are recycled or reused at the facility are based only on the amount of the chemical that is added during the year, not the total volume in the system. However, chemicals recycled off-site and returned to a facility are treated as the equivalent of newly purchased material.

The definitions of manufacture, process, and otherwise use can be summarized as follows:

- **Manufacture** means to produce, prepare, compound, or import a listed chemical, including the coincidental production as a byproduct or impurity.

[4] The reporting threshold is 0.1 gram for the category of dioxin and dioxin-like compounds.

- **Process** means to prepare a listed chemical, after its manufacture, for distribution in commerce. For instance, a company that combines resins, solvents, pigments, and additives to produce paint for sale is processing the constituent chemicals.
- **Otherwise use** encompasses any activity involving a listed chemical that does not fall under the definitions of "manufacture" or "process." For example, lubricants, cooling fluids, refrigerants, hydraulic fluids, cleaners, degreasers, and catalysts are typically otherwise used by the facilities that consume them. The definition of otherwise use includes stabilization, treatment for destruction and disposal on-site of TRI listed chemicals a facility receives from off-site for the purpose of waste management, and TRI listed chemicals manufactured in the course of such waste management activities.

As described in Chapter 2, EPA is lowering reporting thresholds for lead and lead compounds.

1.2.4 EXEMPTIONS

Under certain circumstances, a facility is not required to consider certain activities in its threshold determinations and release and other waste management calculations. The following are the current major exemptions from TRI reporting:

Use Exemptions. The following otherwise uses of listed chemicals are specifically exempted:

- **Use as a non-process related structural component of a facility.** For example, painting of the facility;
- **Use in routine janitorial or facility grounds maintenance.** Examples include non-process related bathroom cleaners and fertilizers or pesticides used to maintain lawns. The exemption applies only when the chemicals are similar in type and concentration as commonly distributed to consumers;
- **Non-process related personal uses by employees or other persons.** For example, food, drugs, and cosmetics;
- **Use for the purpose of maintaining motor vehicles owned and operated by the facility and stationed at the facility.** This exemption includes such chemicals as brake and transmission fluids, oils and lubricants, antifreeze, batteries, and cleaning solutions for purposes of motor vehicle maintenance; and
- **Chemicals contained in intake water or in intake air.** This exemption covers the use of toxic chemicals present in process water and non-contact cooling water as drawn from the environment or from municipal sources, or toxic chemicals present in air used either as compressed air or as part of combustion.

***De Minimis*.** The amount of chemical present in a mixture or trade name product that is processed or otherwise used does not need to be counted towards threshold determinations and release and other waste management calculations if the concentration is less than 0.1 percent of the mixture for chemicals defined as carcinogens by the Occupational Safety and Health

Administration (OSHA), or less than 1 percent of the mixture for all other chemicals. This exemption does not apply to the processing or otherwise use of TRI chemicals in waste streams because wastes are not considered to be mixtures or trade name products. The *de minimis* exemption also applies to TRI listed chemicals that are manufactured as an impurity, but does not apply to chemicals manufactured as byproducts (e.g., a toxic chemical that is separated from a process stream). As described in Chapter 2, EPA is eliminating the *de minimis* exemption for lead and lead compounds, as it has already for certain other PBT chemicals.

Transportation. EPCRA provides an exemption from section 313 for the transportation of chemicals. According to section 327, only the emergency notification requirements in section 304 apply to the transportation of chemicals or their storage incidental to transportation. The conference report for EPCRA clarifies that the exemption relating to storage is limited to materials that are still moving under active shipping papers and that have not reached the ultimate consignee.

Articles. A facility is not required to account for chemicals in articles processed or otherwise used at the facility. An article is a manufactured item: (1) that is formed to a specific shape or design; (2) that has end use functions dependent in whole or in part upon its shape or design; and (3) that does not release a toxic chemical under normal conditions of processing or otherwise use at the facility.

For example, a closed item containing a listed chemical (e.g., a starting, lighting, and ignition battery that contains lead or lead compounds) that does not release the toxic chemical during normal processing or otherwise use activities may be considered an article. However, if the facility services the item (e.g., the battery), any chemical added must be counted in threshold and reporting calculations.

Laboratory Activities. Chemicals that are used in a laboratory for research or quality control under the supervision of a technically qualified individual do not need to be counted. This exemption does not apply to pilot plant scale operations or laboratories that distribute chemicals in commerce.

1.2.5 USE OF READILY AVAILABLE DATA FOR REPORTING

According to section 313(g)(2) of EPCRA, no additional monitoring or measurement of quantities, concentrations, or frequency of release of any listed chemical may be required for the purpose of reporting to TRI. The required information may be obtained from readily available data that are collected pursuant to other provisions of law or as part of routine plant operations. When such data are not available, reasonable estimates, using such methods as published emission factors, materials balance calculations, or engineering calculations, are sufficient.

1.2.6 OTHER

SIC Code Determination

Facilities are subject to TRI reporting if they are in a listed SIC code. SIC codes encompass the following industry groups:

SIC Code	INDUSTRY GROUP
10	Metal mining (except 1011, 1081, 1094)
12	Coal mining (except 1241)
20-39	Manufacturing
4911, 4931, 4939	Electric services (coal and oil facilities only); Electric & other services (coal and oil facilities only); Combination utilities (coal and oil facilities only)
4953	Refuse systems
5169	Chemical and allied products - wholesale
5171	Bulk petroleum
7389	Solvent recovery services

Facilities with multiple SIC codes are covered if their primary SIC code is a listed SIC code. Some facilities have multiple establishments at the same site, with some establishments that are in SIC codes covered by TRI and others that are outside the covered SIC codes. Such facilities must calculate the value of products produced or shipped and/or services provided from each establishment within the facility. If establishments within covered SIC codes account for either a majority or a plurality of the total value of the services provided and/or products shipped from or produced at the facility, the entire facility meets the SIC code criterion. A covered multi-establishment facility must make threshold determinations and, if required, must report to TRI for the entire facility, even from establishments that are outside covered SIC codes.

Range Reporting

Facilities with total annual releases or off-site transfers of less than 1,000 pounds of a listed chemical can report these quantities in ranges (1-10 lbs, 11-499 lbs, or 500-999 lbs) instead of as point estimates. Range reporting lowers the reporting burden for these facilities. As described in Chapter 2, EPA is requiring point estimates for lead and lead compounds, as it has already for certain other PBT chemicals.

Recordkeeping

Facilities must keep a copy of each report filed for at least three years from the date of submission. Facilities must also maintain those documents, calculations, worksheets, and other forms upon which they relied to gather information for their reports. EPA may request documentation to support submitted information or conduct data quality reviews of submissions.

Chemical Categories

A chemical category contains multiple chemicals having similar characteristics and is considered to be one chemical for the purpose of TRI reporting. EPCRA section 313 requires threshold determinations for chemical categories to be based on the total amount of all chemicals in the category. For example, a facility that manufactures three members of a chemical category would count the total amount of all three chemicals manufactured towards the manufacturing threshold for that category. When filing reports for chemical categories, the releases are determined in the same manner as the thresholds. One report is filed for the category and all releases are reported on this form.[5]

About half of the chemical categories are for metal compounds. These compounds generally contain unique chemical substances that contain the parent metal as part of that chemical's infrastructure. The lead compounds category contains any chemical substance containing lead. Some categories are limited to a class of chemicals. For instance, the cyanide compounds category includes any unique chemical described by X^+CN- where $X=H^+$ or any other group where a formal dissociation may occur (for example KCN or $Ca(CN)_2$). Other categories (for instance polycyclic aromatic compounds) are delimited—only certain listed chemicals are included under the category designation.

Most chemical categories are made up of chemicals that are structurally similar or contain similar functional groups and that cause similar toxic effects. For example, the polycyclic aromatic compounds category contains chemicals that are structurally similar and have the same toxicity concern (cancer). However, the chemicals in the metal compounds categories have widely varying structures but they all contain the same metal component and the same toxicity concern.

Trade Secrets

A facility may claim the specific identity of a chemical as a trade secret, but the rest of the report (whether Form R or certification statement) must be completed. To make a trade secrecy claim, the facility must submit two versions of the report (one that identifies the chemical and the other with generic chemical identity instead of the real chemical name) and a trade secret substantiation form. Examples of generic chemical identities might include ketone (for methyl ethyl ketone), mineral acid (for nitric acid), or CFC (for dichlorodifluoromethane). Since there are multiple chemicals on the section 313 list that could be described by one of these generic identities, the specific identity of the chemical would not be disclosed.

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[5] For metals and metal compounds, if a facility exceeds reporting thresholds for both the "parent" metal (e.g., lead) and metal compounds, the facility may file one combined report (e.g., one report for lead compounds including lead) because the release information reported in connection with metal compounds will be the total pounds of parent metal released.

1.3 PUBLIC ACCESS TO AND USES OF THE TRI DATA

Section 313(h) states that data obtained pursuant to section 313 are intended to provide information to the public as well as to Federal, State, and local governments. The TRI program serves the important function of making data available to inform the public about releases to the environment of the listed chemicals; to assist government agencies, researchers, and other persons conducting research and gathering data; to aid in the development of appropriate regulations, guidelines, and standards; and for other similar purposes. Data submitted to EPA in compliance with section 313 are maintained in the national Toxic Release Inventory (TRI) data base, and are accessible to any person on a cost-reimbursable basis.

EPA makes the TRI data available through a variety of formats including hard copy of Form R reports, annual reports summarizing TRI data nationally and state-by-state, CD-ROM, and through the Internet. With its broad dissemination, TRI data has enjoyed extensive use by the public. Facilities have used the data obtained through TRI to better understand their operations, and make better use of pollution prevention opportunities. Public-interest groups have used the data to educate themselves on the presence of toxic chemicals in the environment, and have used that increased information to engage in meaningful, productive dialogue with industry and with all levels of government. In general, TRI data has proven to be a powerful tool in environmental decision making.

1.4 STATEMENT OF NEED

Federal regulations often are used to address significant market failures. Markets will fail to achieve socially efficient outcomes when differences exist between market valuation and social valuation. One type of market failure occurs when one party's actions impose uncompensated costs or benefits on another party outside a market transaction. For example, a manufacturing facility releasing toxic chemicals to the environment may impose environmental and health risks on the residents of the adjacent community without compensating for those risks. Although created by the manufacturing facility, it is the community rather than the facility that bears the cost of these risks. The EPCRA section 313 reporting requirements were designed to address this market failure, at least in part, by providing information to the public and federal, state, and local governments regarding the release of over 600 chemicals and chemical categories to the environment.

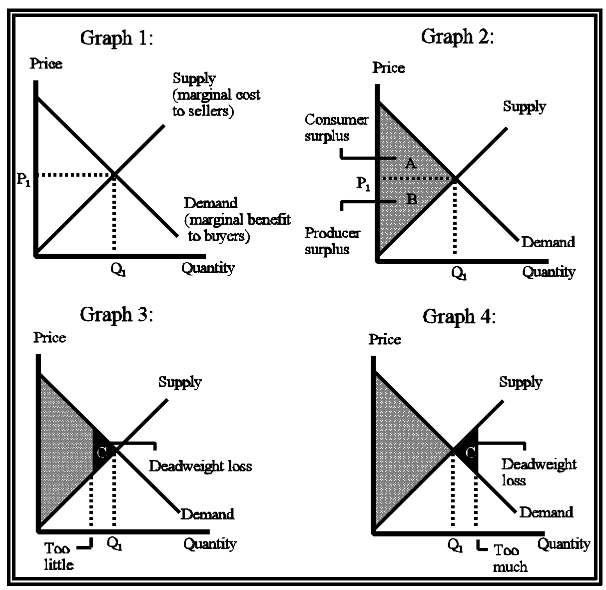
The public is expected to use this information in three important ways. First, the public may use the information to make better informed decisions on where to work and live. Second, as consumers they may use this information to differentiate between the products they purchase, thus bringing economic pressure to bear on polluting companies. Third, they may use information on chemical releases to encourage polluting companies to reduce their releases of toxic chemicals. Governments will use the information to identify hot spots, set priorities, evaluate ecological and human health risks, and design better, more informed regulations. In addition, elements of society apart from government and the public may use the information to make decisions. For example, the information enhances the ability of corporate lenders and purchasers to gauge more accurately a facility's potential environmental liabilities.

The following discussion first provides a review of the theory of market failure and how it can be corrected, and then describes the role that TRI can play in correcting a specific market failure.

1.4.1 THE THEORY OF MARKET FAILURE

The theory of modern welfare economics states that allocative efficiency is achieved when it is impossible to change the allocation of resources in such a way as to make someone better off without making someone else worse off. More precisely, economic theory states that allocative efficiency occurs where consumers' marginal benefit exactly equals producers' marginal cost (Samuelson and Nordhaus, 1985). Graph 1 (Figure 1-1) illustrates the efficient allocation of resources. Where the two curves cross, the price is such that demand equals supply and the marginal benefit from consuming that amount exactly matches the marginal cost of producing it. If output were higher, the cost of producing any additional units will exceed their marginal value. Conversely, any decrease in the number of units produced will result in a situation where the benefit of consuming more will exceed the costs of production.

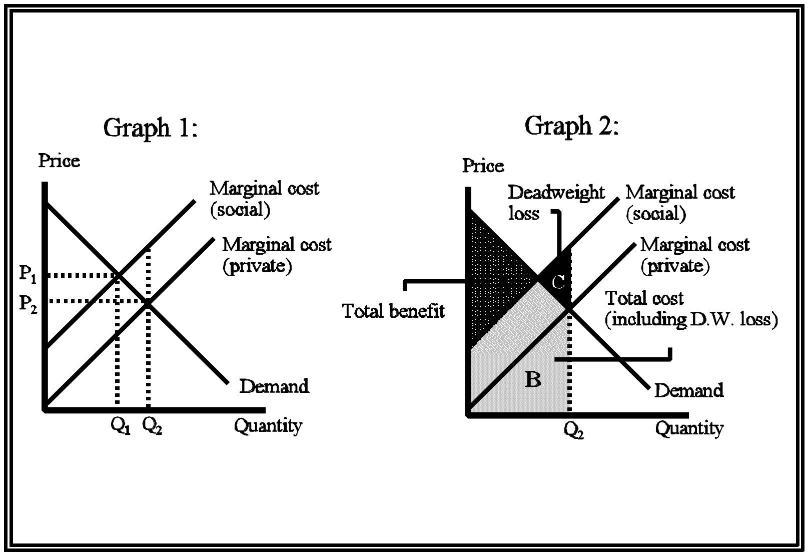
FIGURE 1-1: MARKET EFFICIENCY



In Graph 2 (Figure 1-1), the upper shaded area indicates the difference between the price consumers actually pay for a good and the price consumers would have been willing to pay rather than do without. This difference is known as consumer surplus (area A). The lower region reflects the producer surplus (area B): revenues received less the costs of production. The total welfare gain (consumer and producer surplus) due to the production and consumption of this good is maximized at the efficient quantity Q_1. If the economy fails to achieve this efficient output, society suffers a loss in potential welfare, what economists call a deadweight loss. Graphs 3 and 4 (Figure 1-1) illustrate the deadweight loss (area C) incurred from producing too little or too much of a good, respectively.

The allocation of resources generated by the interaction of supply and demand, however, will not always be desirable from the standpoint of society. The market will fail to achieve a socially efficient outcome when differences exist between market valuation and social valuation. The economic literature identifies four causes of market failure: externalities, public goods, market power (i.e., monopoly, monopsony, and oligopoly), and information asymmetries. The following discussion focuses on externalities and information asymmetries.

FIGURE 1-2: SOURCES OF MARKET FAILURE



In the case of externalities, one party's actions impose uncompensated benefits or costs on another party. For example, in the performance of manufacturing and other business activities, entities may release pollution or cause other environmental harm without accounting for the consequences of these actions on other parties such as members of the local community. These costs are not recognized by the responsible entity in the conventional market-based accounting framework. For example, a company that produces and/or uses hazardous chemicals will pay for labor and capital but will not pay for environmental damages resulting from their emissions of these hazardous chemicals. Because these costs are not recognized by the responsible entity, they are not considered in the consequent production and pricing decisions of the firm. Economists refer to such costs as external costs or externalities.[6] To the extent that these externalities are negative (i.e., impose costs on society), an overproduction and overuse of environmentally hazardous chemicals will occur and an inefficient level of environmental quality will result (Mills and Graves, 1986). One approach to addressing such an externality would be to reduce production of environmentally hazardous chemicals at the firm. A second approach would involve the adoption of pollution prevention practices which might or might not also reduce production at the firm, depending on whether or not the pollution prevention practices result in efficiency gains and the firm's ability to pass on the cost of pollution prevention to consumers.

Graph 1 (Figure 1-2) illustrates the over-production of goods due to the existence of external costs. The private marginal cost curve differs from the social marginal cost curve (private costs + external costs). The distance between the social marginal cost curve and the private marginal cost curve represents the cost to society imposed by the externality. The outcome is a pricing structure such that Q_2 units are produced at price P_2. If the external costs were fully internalized and producers were in fact operating on the social marginal cost curve, the *socially* efficient quantity Q_1 would result and consumers would pay a higher price at P_1.[7] The

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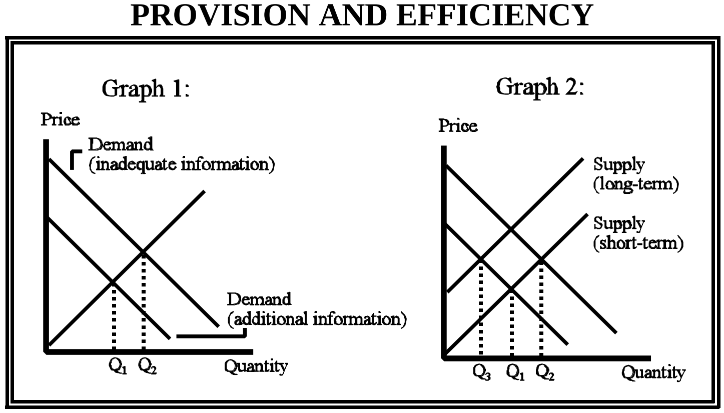
[6] The origin of modern externality theory can be traced back to John Stuart Mill's *Principles of Political Economy*, Alfred Marshall's *Principles of Economics*, and A.C. Pigou's *Wealth and Welfare*.

[7] It should be noted, however, that producers may be able to reduce the externality without decreasing production all the way to Q_1. If a producer adopts pollution prevention practices that result in efficiency gains, the

social loss associated with the production of Q_2 is shown by the dark shaded area (area C) in Graph 2 (Figure 1-2) which corresponds to the amount of over production that results from producers operating on the private marginal cost curve instead of the social marginal cost curve. The deadweight loss is the difference between total costs (area B and C) and total benefits (area A). This is the same deadweight loss that was illustrated in Graph 4 (Figure 1-1).

The market may also fail to efficiently allocate resources in cases where consumers systematically lack perfect information. In economic theory, perfect information among buyers and sellers is required for individuals to make rational decisions and for resources to be efficiently allocated. There are at least three ways in which information is not, in fact, perfect, which potentially diminishes the efficiency of individuals' decisions: 1) there may be variation in the amount of information held by different market participants (producers and consumers), affecting their potential to realize gains from trading; 2) there may be uncontrollable uncertainty that affects all outcomes, such as how much rainfall will be available to grow a particular crop; and 3) consumers may not have sufficient information regarding the consequences of their decision to make rational decisions, and may or may not be aware of the limitations of the information they do have. This discussion is limited to the third type of imperfect information. Lacking full information of the consequences of their purchases, consumers may over-value or under-value the goods in question. When consumers lack information regarding the negative consequences of their purchases, the result will be a misallocation of resources due to excess demand. For example, increased awareness of the health hazards associated with smoking has resulted in a permanent decrease in the demand for cigarettes (Parkin, 1990). While producers have a strong incentive to inform consumers of the positive aspects of their products in order to increase demand, they do not ordinarily have an incentive to furnish consumers with information regarding the negative consequences associated with their products' use or production, such as the release of toxic chemicals to the environment.

FIGURE 1-3: INFORMATION PROVISION AND EFFICIENCY



Graph 1 (Figure 1-3) illustrates a shift in demand and reduction in the production quantity due to the provision of information. When furnished with full information, consumer demand shifts inward, resulting in a short-term pricing structure such that the quantity Q_1 is produced. Following a permanent decrease in demand, the market price will fall and some firms will leave the industry. As producers leave the industry, the supply curve shifts to the left and the equilibrium price will gradually rise back to its original level as the market returns to a state of long-term equilibrium (Parkin, 1990). Graph 2 (Figure 1-3) illustrates this shift in supply

externality can be reduced without reducing the quantity produced. In this case, the social marginal cost curve would shift closer to the private marginal cost curve.

resulting in a further reduction in the efficient quantity to Q_3. This long-term equilibrium will result as consumers respond to full information by changing their purchasing decisions (increasing or decreasing their consumption), by changing the way they use a product, or by altering their choice of where to live and work.

In the event of a significant market failure, public intervention is often required to override the market directly or to configure market incentives in order to achieve a more socially efficient outcome.[8] Several alternative approaches are available to address market failure and to move society closer to an efficient allocation of resources: command-and-control (C&C) strategies, incentive-based strategies, and information-based strategies. C&C strategies tend to be less sensitive to differences in costs and benefits across polluters by setting standards for the quantities of pollutants a source may release. This approach is typically implemented by mandating specific control technologies (design standards) or specific environmental targets (performance standards). C&C strategies have been widely criticized within the economic literature on several grounds. By imposing a uniform standard across all facilities without consideration of the relative costs of emissions control, the standards approach forgoes possible savings that could be achieved by reallocating emissions reductions among firms in such a way as to achieve the same overall reductions but at a lower cost.

Figure 1-4 illustrates the inefficiency of a standard as it applies to two facilities (A and B). Graphs 1 and 2 illustrate the marginal abatement costs—the added costs of achieving a one-unit decrease in emission level—faced by facilities A and B.[9] In both cases, marginal abatement costs increase as greater emission reductions are achieved. Also, marginal abatement costs for any level of emissions are lower for facility A. This situation may result because facility B is older and more expensive to retrofit with pollution control devices. Because marginal abatement costs vary between facility A and B, the standards approach, whether design standards or performance standards, will fail to minimize total abatement costs. Assuming that a maximum emission limit of 10 tons/month is set for each facility, facility A will incur compliance costs equal to area C (Graph

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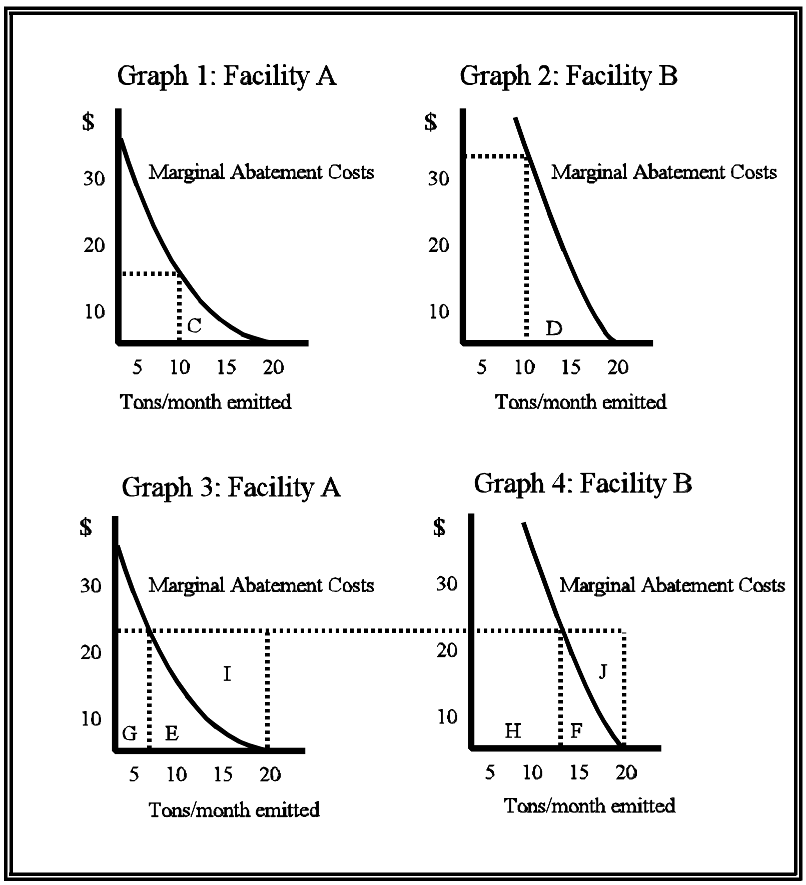
[8] Economists have argued that it is theoretically possible for the firm to negotiate with members of the community about payments to compensate them for the damages they suffer, yielding an efficient distribution of resources even in the presence of externalities (Davis and Hulett, 1977). In his article *The Problem of Social Cost*, R. H. Coase suggests that public intervention is not necessary to correct market imperfections because the affected party may be able to pay the producer of the externality to reduce their activities which result in external costs or to implement pollution controls. Theoretically, the affected party would be willing to offer a “bribe” for incremental pollution reductions up to the point where marginal abatement costs and marginal damages are equal. Both parties would be better off up to this point because the incremental payments made by the affected party will not exceed their marginal damages (the affected party benefits) and the payments received by the firm will exceed their marginal costs of pollution abatement (the polluter benefits). A *socially* efficient level of production is achieved (the equity implications of this solution are not factored into this outcome). For the proper operation of the Coase Theorem, several conditions (which are often unmet in cases of environmental pollution) must be present: 1) property rights must be well defined, enforceable, and transferable; and 2) transaction costs must be minimal in order to allow negotiation to occur (Field, 1994).

[9] Graphs in Figure 1-4 should be read from right to left, with marginal abatement costs increasing as greater emission reductions are achieved. The area below the marginal abatement cost curve indicates the total costs of abatement. Left unregulated facility A and B will each release 20 tons/month of emissions.

1) and facility B will incur compliance costs equal to area D (Graph 2). However, emission reductions can be reallocated between facilities A and B in such a way as to achieve aggregate abatement costs lower than area C + D. Graphs 3 and 4 illustrate the most efficient (i.e., least cost) allocation that still reduces emissions to 20 tons/month. By reducing emissions to roughly 6 tons/month at facility A and roughly 14 tons/month at facility B, aggregate abatement costs (E + F) are minimized. In all cases, aggregate abatement costs across firms are minimized where marginal abatement costs are equal (in Graphs 3 and 4, roughly $21).[10] Total reductions are equal to those achieved under the uniform standard (i.e., 20 tons/month), however, total abatement costs are minimized. We will see below that the incentive approach creates a mechanism by which emission reductions occur at least cost by equalizing marginal abatement costs across firms.

Thus far, the discussion has focused on the inefficiency of a uniform standard in achieving a specific emission level. This is a question of cost-effectiveness—does our regulatory approach achieve a given emission level at least cost? In order to insure an efficient allocation of resources, however, emissions must not only be reduced at least cost but must also be reduced to a socially efficient level. Recall that the efficient allocation of resources occurs where marginal benefits equal marginal social costs (Figures 1-1 and 1-2). If a standard is set such that emissions are too high or too low, a deadweight loss will result. In Figure 1-4, emissions were reduced to 20 tons/month. In order to determine if 20 tons/month is the efficient level of emissions, the regulating agency requires data to estimate the shapes of the aggregate marginal cost curve as well as the aggregate marginal benefit curve. Information such as total releases, marginal abatement costs, and human and environmental damages are required to estimate an efficient level of emissions.

FIGURE 1-4: THE INEFFICIENCIES OF STANDARDS



10 The equimarginal principle states that aggregate costs across facilities are minimized where marginal costs are equal. The principle is not only relevant to pollution abatement costs, but also applies to any situation in which marginal costs vary. For example, a shoe manufacturer that operates multiple facilities may ask how to allocate production of 10,000 shoes across 12 different facilities while minimizing aggregate production costs. The answer is to allocate their production such that marginal costs are equal across all facilities (Field, 1994).

Assuming that 20 tons/month is the socially efficient level, Figure 1-4 illustrates that a uniform standard may achieve efficiency, but will not do so at least cost.

In addition to their efficiency short-comings, command-and-control strategies will sometimes discourage technological innovation or create a weaker incentive for innovation than the incentive-based approaches discussed below. In the case of a technology based standard, firms will tend to adopt the technology represented by the standard regardless of whether a better (i.e., less expensive) alternative exists. It is thought that it is better to insure compliance than attempt to justify the merits of an alternative approach. In the case of a technology based standard, no incentive exists for research and development (R&D). When faced with a performance standard, the incentive for engaging in R&D equals any avoided compliance costs; however, as we will see below, this is a weaker incentive than that created by the incentive approach (Field, 1994). Both the incentive approach as well as the information based strategies have advantages compared to the standards approach.

Incentive strategies, rather than mandating a uniform standard across all generators, place a price on every unit of pollution and create an incentive for emitters to reduce their emissions. The most common approach is to set a charge per unit of pollution; however, other alternatives are also suggested in the literature, including tradeable discharge permits and abatement subsidies (Field, 1994). The general theory presented in the following discussion on emissions fees is applicable to all incentive strategies.

Several studies have been conducted supporting the efficiency advantages of incentive strategies while simultaneously revealing the unnecessary costs imposed by the command-and-control approach. The most widely known sources include: *Pollution, Prices, and Public Policy* by Allen Kneese and Charles Schultze, *The Public Use of Private Interest* by Charles Schultze, and *Economics of the Environment*, a collection of essays edited by Robert and Nancy S. Dorfman. Incentive type approaches are able to reduce the same quantity of emissions at a lower cost compared to command-and-control strategies because an incentive is created for reductions to occur where it is least costly to do so. For example, a charge per ton of SO_2 will create an incentive for firms to reduce their emissions until their marginal cost of reducing one additional ton exceeds the per ton emissions fee. Firms that can economically reduce their SO_2 emissions will do so, while others may choose to incur the cost of the fee. Higher emission charges will induce greater emissions reductions and a reduction in the emissions fee will increase emissions.

Returning to Graphs 3 and 4 (Figure 1-4), it can be seen that an emissions fee will automatically lead to the most efficient allocation of emissions reductions (i.e., where marginal abatement costs are equal). By establishing a fee of $21/ton/month, an incentive is created for facility A to reduce emissions to roughly 6 tons/month. By reducing emissions to 6 tons/month, facility A incurs total fee payments equal to area G and total abatement costs equal to area E. If facility A were to continue emitting 20 tons/month and incur the entire cost of the fee, total fee payments would equal area G + E + I. Assuming that facility A and B are operating in a competitive market with perfect information, they will reduce their emissions up to the point where marginal abatement costs are equal to the per ton fee, effectively minimizing their total costs (i.e., emissions fee plus abatement costs). Facility B, operating under the same competitive pressures, will reduce emissions to roughly 14 tons/month, incurring costs equal to area H (fee payment) and F (abatement cost). Because of the incentive created by an emissions fee, emission reductions will automatically be allocated such that abatement costs are minimized. In addition, the incentive to engage in research and development efforts is stronger under an emissions fee than under a standard. Recall that the incentive for R&D under an emissions standard is equal to avoided compliance costs. In contrast, the incentive to engage in R&D under an emissions fee is equal to avoided compliance costs plus any avoided fee payments.

While an emissions fee will insure that reductions occur at least cost, it will not insure a socially efficient allocation of resources. In order to achieve an efficient allocation of resources, an emissions fee must be set such that marginal benefits equal marginal social costs. If an emissions fee is set too high or too low, a deadweight loss will result. As with the standards approach, the regulating agency requires data in order to estimate the shapes of the aggregate marginal cost curve and the aggregate marginal benefit curve. An alternative option would be to establish an emissions fee, then observe ambient pollution levels and determine if a socially efficient outcome results. If ambient pollution levels decrease by too much or too little, the fee would then be lowered or raised as appropriate. Such an approach, however, is likely to be enormously disruptive to industry. Industry is likely to respond to an emissions fee by investing in costly pollution-control technology. Any changes in the emissions fee are likely to disrupt capital investment plans, placing a further premium on accurate data to estimate an appropriate emissions charge from the beginning. Although an emissions fee may not always achieve an efficient level of pollution, it will allocate reductions at least cost.[11]

The third approach to addressing the existence of externalities is information-based strategies. As in the case of incentive strategies, information-based strategies provide a more market oriented alternative to command-and-control approaches. Specifically, they can lead to more cost-effective reductions in chemical emissions by allowing facilities the flexibility to decide whether and how to make reductions. The approaches are quite varied: government testing and rating systems, mandatory disclosure requirements such as labeling and periodic reporting, and government provision of information. As illustrated above, the provision of information works to internalize costs by informing consumers of the external economies and diseconomies associated with their purchasing decisions.[12] Consumers may respond to the additional information by changing their purchasing decisions (increasing or decreasing their consumption), by changing the way they use a product, or by altering their choice of where to live and work.[13] In cases where

[11] In contrast, an emissions standard will not always achieve an efficient level of pollution and is unlikely to allocate reductions at least cost. In order for an emissions standard to minimize abatement costs, all facilities must operate under the same marginal abatement cost structure.

[12] Provision of information may be at least one step removed as in the case where the hazard associated with a product may be attributable to an input, not the final product.

[13] Information provision may also influence how consumers allocate their time, in addition to how they allocate their purchasing decisions. For example, information regarding the health benefits of regular exercise may encourage consumers to allocate more of their time to exercise.

the market is unlikely to provide adequate information, public intervention is sometimes required to provide consumers with information that will allow them to make these decisions efficiently.

1.4.2 THE EFFECT OF TRI INFORMATION ON MARKET FAILURE

Through the provision of toxic chemical release data, the Toxic Release Inventory (TRI) overcomes firms' disincentive to provide information on their toxic releases and moves society toward an efficient allocation of resources in three important ways:

1) *By allowing more informed decisions to be made by society, consumers, and corporate lenders, purchasers and stockholders*. According to OMB guidance, "If intervention is necessary to address a market failure arising from inadequate information, informational remedies will generally be the preferred approaches. As an alternative to a mandatory standard, a regulatory measure to improve the availability of information has the advantage of being a more market-oriented approach. Thus, providing consumers information about concealed characteristics of consumer products gives consumers a greater choice than banning these products" (OMB, 1996). In the case of toxic chemical releases, however, it is not just consumers that are affected.[14] Rather, society at large is affected by the release of toxic chemicals into their communities. It is individuals in society that bear the burden of the externality and individuals in society that require information on toxic chemical releases in order to make rational decisions regarding such things as where to live and work.

By informing society of the toxic chemical releases in their communities, an incentive is created for industry to reduce emissions. Release data holds the potential to adversely affect a company's public image and companies may respond to that possibility whether their concern be real or perceived. Santos, Covello, and McCallum surveyed 221 facilities subject to TRI reporting and found that nearly all facilities had reported reduced emissions and half had increased their environmental communication activities despite the fact that public inquiries did not increase. The authors interpret their results as an indication that the mere potential for adverse public reaction may provide an important motivator for emissions reductions (Santos et al., 1996). Information provision will not correct the entire market failure. However, to the extent that companies "perceive" that their public image will be adversely affected by the public dissemination of toxics release data, they will respond by reducing emissions. Concerns are most likely to exist when facility releases per unit of production (which can be calculated using TRI data in conjunction with production data) are higher than average within their industry or releases are increasing over time. Such determinations could not be made without the inter-temporal and inter-facility data provided by TRI.

In addition to informing affected communities and consumers, the information provided by TRI enhances the ability of corporate lenders, purchasers, and stockholders to more accurately gauge a facility's potential environmental liabilities, again resulting in better-informed decision

[14] TRI data does not provide total chemical releases for a consumer ready product, therefore, demand changes attributable to TRI are assumed to be limited. In addition, the external costs of toxic chemical releases are not always borne by the consumer of the product, further diminishing the likely impact on consumer demand.

making. Investors who are unaware of a firm's emissions may overvalue their stock because they have inadequate information regarding the company's potential liability, abatement expenditures, and fines. Better information will help stockholders to more accurately value the stock (Hamilton, 1995).

2) *By providing vital information for the efficient design and targeting of federal, state, and local enforcement and regulatory programs*. Toxic chemical release data is used by governments to identify hot spots, set priorities, and monitor trends, all of which can yield more informed decisions. For example, EPA's Office of Air and Radiation (OAR) has used TRI data for a variety of tasks related to the implementation of the Clean Air Act Amendments of 1990 (CAAA): 1) TRI data have been used in setting research priorities for the 189 Hazardous Air Pollutants (HAPs) identified in the CAAA; 2) TRI data are used by OAR to target potential sources for inclusion in the Early Reductions Program (a means of achieving enforceable reductions of toxic emissions before a regulation is in place); and 3) TRI facility-level locational data are being used in conjunction with other demographic data to improve exposure assessment. The TRI is unique in that it allows comparisons between firms within the same industry as well as across industries, again enabling better-informed decisions in the design of regulations as well as in the development of voluntary programs. Moreover, because of the way the information is disseminated, such decisions do not have to be made by the federal government, but can also occur at the state or local level. TRI data will not fully internalize the external costs associated with the release of toxic chemicals; however, to the extent that TRI contributes to the efficient design of new regulations and voluntary programs, external costs are likely to be addressed in an efficient manner.

3) *By informing facilities of opportunities to reduce emissions*. TRI information provides facilities themselves with important information for judging their own performance and may alert them to opportunities for the implementation of pollution prevention or recycling projects. In some cases, firms may change their behavior by increasing recycling or treatment efforts without affecting the marginal costs of production. Behavioral changes that minimize the cost of production will be in the firms' own self-interest. In such cases, emissions may be reduced without any affect on consumption.

While the TRI does provide information on chemical releases, it does not provide any information on the costs associated with the externalities created by such releases. However, the dissemination of information through TRI mitigates two causes of market failure: incomplete information and externalities. By addressing these market failures, TRI moves society closer to an efficient allocation of resources and increases social welfare. Addressing market failure through information provision avoids inefficiencies inherent in command-and-control regulations. Also, to the extent that TRI informs regulating agencies of the marginal costs and benefits associated with the release of toxic chemicals, inefficiencies associated with incentive strategies may be avoided.

1.5 STATUTORY AUTHORITY

EPCRA section 313 contains default reporting thresholds, which are set forth in section 313(f)(1). Section 313(f)(2) allows EPA to "establish a threshold amount for a toxic chemical different from the amount established by paragraph (1)." The amounts established by EPA may, at the Administrator's discretion, be based on classes of chemicals or categories of facilities. There are no requirements that trigger EPA's authority to revise the reporting thresholds, nor is the Agency required to exercise that authority under any particular circumstances. Instead, section 313(f)(2) is a broad authority that EPA may use as appropriate, in EPA's judgment, to set thresholds for particular chemicals, classes of chemicals, or categories of facilities. EPCRA section 328 provides the authority for EPA to make modifications to other section 313 reporting requirements. Specifically, section 313 provides that the "Administrator may prescribe such regulations as may be necessary to carry out this chapter."

1.6 PURPOSE AND SCOPE OF THIS REPORT

This report examines the increase in reporting that will result from modifying the TRI program to obtain additional reports on lead and lead compounds. The specific modifications to the TRI program are described in detail in Chapter 2.

1.7 ORGANIZATION OF THIS REPORT

This report examines the potential increase in reporting that would result from lowering TRI reporting thresholds for lead and lead compounds. This report also estimates the costs to industry and EPA associated with the reporting burden and other impacts of the rule. The remainder of this report is organized as follows:

- **Chapter 2** describes the regulatory options and modifications to reporting requirements considered by EPA.
- **Chapter 3** summarizes the expected number of reports and facilities affected by the final rule.
- **Chapter 4** presents the methodology used to estimate the costs and the results of the analysis in terms of total cost to industry and total cost to EPA.
- **Chapter 5** examines the impacts of the final rule, including those impacts on "small" entities as required by the Regulatory Flexibility Act of 1980.
- **Chapter 6** evaluates the benefits of additional reporting on lead and lead compounds.
- **Appendix A** describes in detail the analysis performed to develop estimates of the number of reports and affected facilities.
- **Appendix B** presents revenue deciles and cost impact percentages for large companies.

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CHAPTER 2
DESCRIPTION OF REGULATORY OPTIONS

This chapter describes the regulatory options considered for this final rule. Section 2.1 presents background information on the development of the regulation. Section 2.2 discusses the changes to the reporting thresholds. Other changes to the section 313 reporting requirements for lead and lead compounds are identified in section 2.3.

2.1 BACKGROUND

Section 313(f)(1) of EPCRA sets reporting thresholds at 25,000 pounds for chemicals that are manufactured or processed and 10,000 pounds for chemicals that are otherwise used. Because of the persistent and bioaccumulative characteristics of lead and lead compounds, existing EPCRA 313 reporting thresholds may preclude the capture of important information because facilities manufacture, process, or otherwise use lead and lead compounds at levels below the current reporting thresholds. Under the final rule, EPA is revising reporting thresholds for lead and lead compounds. The lower reporting thresholds that EPA has considered are described in section 2.2.

In addition to revising the thresholds for these chemicals, the Agency is also enacting other concurrent changes for reporting of lead and lead compounds, such as eliminating the *de minimis* exemption. These changes are described in section 2.3.

2.2 REVISED REPORTING THRESHOLDS

Under the current section 313 reporting requirements, information on lead and lead compounds at certain facilities is not captured by TRI due to the levels at which reporting thresholds are set. Under section 313(f)(1) of EPCRA, reporting thresholds are currently set at 25,000 pounds for chemicals that are manufactured or processed, and 10,000 pounds for chemicals that are otherwise used. Facilities with less than these threshold amounts do not currently report to TRI.

The regulatory options that EPA evaluated were created by varying the reporting thresholds from their current levels of 25,000 pounds for manufacture and processing, and 10,000 pounds for otherwise use of EPCRA section 313 chemicals. EPA considered the following options for reporting of lead and lead compounds to TRI:

- **Option 1.** Reporting threshold of 1 pound of lead and/or lead compounds manufactured, processed, or otherwise used.

- **Option 2.** Reporting threshold of 10 pounds lead and/or lead compounds manufactured, processed, or otherwise used.

- **Option 3.** Reporting threshold of 100 pounds lead and/or lead compounds manufactured, processed, or otherwise used. This is the selected option presented in the regulatory text.

- **Option 4.** Reporting threshold of 1,000 pounds lead and/or lead compounds manufactured, processed, or otherwise used.

2.3 OTHER CHANGES

EPA is also enacting a number of additional changes in TRI reporting to obtain additional reporting on lead and lead compounds.

2.3.1 ELIMINATION OF *DE MINIMIS* EXEMPTION

EPA is eliminating the *de minimis* exemption for lead and lead compounds. Reporters under EPCRA section 313 are currently allowed a limited *de minimis* exemption for certain low concentrations of chemicals in mixtures or other trade name products they process or otherwise use. The *de minimis* exemption also applies to the manufacture of a toxic chemical as an impurity if it remains below *de minimis* concentrations in the product distributed in commerce, or if it is imported in below *de minimis* concentrations. In these situations, facilities may disregard *de minimis* concentrations of toxic chemicals in making threshold determinations and release and other waste management calculations for section 313 reporting. Manufacture of a toxic chemical as a byproduct is not covered by the *de minimis* exemption. Currently, it is possible to meet an activity threshold for a toxic chemical on a facility-wide basis, but not be required to submit a report under section 313 because the facility only deals with mixtures or trade name products containing the toxic chemical at levels below *de minimis* concentrations.

The *de minimis* exemption was not intended as a small quantity exemption, but as an exemption based on the limited information likely to be readily available to facilities affected by EPCRA section 313. Allowing facilities to continue to take the *de minimis* exemption for lead and lead compounds may deprive communities of important information on these chemicals. Some facilities may exceed the lower reporting threshold based on processes that involve lead and lead compounds in a mixture where the lead or lead compound is below the applicable *de minimis* level. All releases and other waste management activities associated with these activities would then be exempt from reporting. While these chemicals may exist in mixtures below the *de minimis* levels, they still concentrate in the environment and in organisms.

It should be noted that EPCRA does not require additional monitoring or sampling in order to comply with the reporting requirements under EPCRA section 313. Information used should be based on production records, monitoring, or analytical data, guidance documents provided by EPA and trade associations, and reasonable judgment on the part of the facility's management. Even with the elimination of the *de minimis* exemption for lead and lead compounds, no further monitoring or analysis of production, process, or use is required.

As noted above, the *de minimis* exemption does not currently apply to the manufacture of toxic chemicals as byproducts. Thus, eliminating it would have no net effect on the additional reporting of chemicals that are manufactured as byproducts. At lower reporting thresholds, the facilities most likely to have activities qualifying for the existing *de minimis* exemption would be those that process lead and lead compounds as trace components of coal or petroleum products. To qualify for the *de minimis* exemption, the concentration of lead or lead compound in the product would have to be below *de minimis* levels (0.1 percent for lead and inorganic lead compounds, and 1 percent for organic lead compounds). In addition, no lead or lead compound could be manufactured as a byproduct as a result of processing activities. This second factor would exclude facilities whose operations result in the manufacture of lead or lead compounds as byproducts due to high temperatures or chemical reactions.

Based on information presented in Appendix A, it appears that the facilities with operations most likely to qualify for the *de minimis* exemption would come from the following SIC codes:

- Coal mining (SIC code 12);
- Dog and cat food (SIC code 2047);
- Prepared feeds, n.e.c. (SIC code 2048);
- Nitrogenous fertilizers, except organics (SIC code 2873);
- Organic fertilizers (SIC code 28733);
- Phosphatic fertilizers (SIC code 2874);
- Fertilizers, mixing only (SIC code 2875);
- Petroleum refining (SIC code 2911);
- Steel wiredrawing and steel nails and spikes (SIC code 3315);
- Primary production of aluminum (SIC code 3334);
- Aluminum sheet plate and foil (SIC code 3353);
- Aluminum extruded products (SIC code 3354);
- Aluminum die-casting (SIC code 3363);
- Aluminum foundries (SIC code 3365);
- Electric services (coal and oil facilities only) (SIC code 4911);
- Electric and other services (coal and oil facilities only) (SIC code 4931);
- Combination utilities (coal and oil facilities only) (SIC code 4939);
- Coal-fired industrial sources (SIC code 20-39);
- Oil-fired industrial sources (SIC code 20-39); and
- Wood-fired industrial sources (SIC code 20-39).

The *de minimis* exemption potentially could also be taken by facilities in other industry groups; however, additional information would be required to determine if lead or lead compounds are manufactured as a byproduct or as an impurity. If lead or lead compounds are manufactured exclusively as an impurity, these facilities could also take advantage of the *de minimis* exemption if the exemption were to be retained for lead and lead compounds. These SIC codes include:

- Gold ores (SIC code 1041);
- Pulp mills (SIC code 2611);
- Asphalt paving mixtures (SIC code 2951);
- Cement, hydraulic (SIC code 3241);
- Blast furnaces and steel mills (SIC code 3312);
- Electrometallurgical products (ferroalloys) (SIC code 3313);
- Gray/ductile iron foundries (SIC code 3321);
- Malleable iron foundries (SIC code 3322);
- Steel investment foundries (SIC code 3324);
- Steel foundries, n.e.c. (SIC code 3325);
- Copper rolling and drawing (brass and bronze) (SIC code 3351);
- Electroplating, plating, polishing, anodizing, and coloring (SIC code 3471);
- Galvanizing (part of SIC 3471, Metal coating, engraving and allied services) (SIC code 3479);
- Electronic components and accessories (SIC code 367);
- Motor vehicles and motor vehicle equipment (SIC code 371); and
- Bulk petroleum (reports would be expected for aviation gas only) (SIC code 5171).

The incremental cost of eliminating the *de minimis* exemption as it applies to lead and lead compounds has not been estimated separately from the regulatory options for lower reporting thresholds. However, the expected effects of this action on reporting of lead and lead compounds have been incorporated into the estimates of additional reporting. The estimated industry cost for each regulatory option, as presented in Chapter 3, incorporates the elimination of the *de minimis* exemption for lead and lead compounds.

2.3.2 ALTERNATE THRESHOLD AND FORM A

EPA is requiring facilities to file Form R reports for lead and lead compounds. Current regulations allow facilities that have less than 500 pounds of production-related waste of a listed toxic chemical and that do not manufacture, process, or otherwise use more than one million pounds of that listed toxic chemical to file a Form A certification statement. The Form A certifies that the facility does not exceed either of these quantities for the toxic chemical, and includes facility and chemical identification information.

EPA is excluding all lead and lead compounds from the alternate threshold of one million pounds. While the Form A does provide some general information on the quantities of the chemical as waste that the facility manages, the release, transfer, and waste management information is much more limited than that provided by the Form R.

The costs of this action are reflected in the "Per Report Cost" section of the cost analysis described in Chapter 4. All of the additional reports filed under the regulatory options are assigned the unit cost for filing the Form R.

2.3.3 RANGE REPORTING

EPA is requiring facilities filing reports on lead and lead compounds to report numerical values for releases and off-site transfers for waste management. EPA currently allows facilities to report the amount either as a whole number or by using range codes for releases and off-site transfers for further waste management of the toxic chemical of less than 1,000 pounds. The reporting ranges are: 1 to 10 pounds; 11 to 499 pounds; and 500 to 999 pounds. For larger releases and off-site transfers for further waste management of the toxic chemical, the facility may report only the whole number.

The Agency has noted a number of drawbacks to range reporting. Use of ranges could misrepresent the data because the low or the high end range numbers may not be close to the estimated value, even taking into account its inherent error (i.e., errors in measurements and developing estimates). The user of the data must make a determination on whether to use the low end of the range, the mid-point, or the upper end. For example, a release of 501 pounds could be misinterpreted as 999 pounds if reported as a range of 500 to 999. This represents a 100 percent error. This uncertainty severely limits the usefulness of release information where many releases, particularly for PBT chemicals, may be within the amounts eligible for range reporting.

The elimination of range reporting for lead and lead compounds is not expected to affect the unit cost of reporting. Range reporting is related to how information is *presented* on the reporting form rather than how it is *calculated*. For example, a facility would calculate its estimate of chemical releases or other waste management quantities based on readily available information. Under current reporting rules, the facility then has the option of presenting the result (if less than 1,000 pounds) as a point estimate <u>or</u> as a range in sections 5 and 6 of the Form R. There is no range reporting option for the presentation of data in section 8. As an issue of presentation, the elimination of range reporting for lead and lead compounds is not expected to have any effect on unit reporting costs.

2.3.4 HALF-POUND RULE AND WHOLE NUMBER REPORTING

For lead and lead compounds, EPA is requiring that all releases or other waste management quantities of greater than a tenth of a pound be reported, provided that the appropriate activity threshold has been exceeded and provided that the accuracy and underlying data support this level of precision. EPA is also requiring that for release and other waste management quantities less than ten pounds, fractional quantities (e.g., 6.2 pounds) rather than whole numbers are to be reported. EPA currently requires that facilities report numerical quantities as whole numbers.

For lead and lead compounds, if the facility's release or other waste management estimates support reporting an amount that is more precise than whole numbers and two significant digits, then the facility should report that more precise amount. If the data and/or estimation techniques do not support this degree of accuracy, then the facility's estimates are not required to be reported to a greater degree of accuracy than is available.

EPA currently requires that facilities report numerical quantities in sections 5, 6, and 8 of Form R as whole numbers and does not require more than two significant digits. EPA also currently allows facilities to round releases of 0.5 pounds or less to zero. The combination of requiring the reporting of whole numbers and allowing rounding to zero may result in a significant number of facilities reporting their releases of lead and lead compounds as zero.

As an issue of presentation rather than estimation, this action for lead and lead compounds is not expected to have any effect on unit reporting costs.

2.3.5 REPORTING LIMITATION FOR METALS IN ALLOYS

EPA is limiting the reporting of TRI metals that are contained in certain alloys. Lead can be found in various types of alloys used at facilities that are subject to reporting under section 313. EPA is excluding lead from reporting at the lower threshold when contained in brass, bronze, or stainless steel alloys.

Under this limitation, reporting facilities that make alloys may still report for lead and lead compounds when they are being used to manufacture an alloy. However, once incorporated into a brass, bronze, or stainless steel alloy, is not reportable at the lower threshold. Cutting, grinding, shaving, and other activities involving a brass, bronze, or stainless steel alloy do not negate the reporting limitations for alloys containing lead, and therefore do not need to be reported at the lower reporting threshold.

The effects of this action have been incorporated into the estimates of additional reports and reporting facilities. No additional reports at the lower reporting thresholds have been predicted from facilities at the lower threshold as a result of cutting, grinding, shaving, and other activities involving a brass, bronze, or stainless steel alloy.

CHAPTER 3
ESTIMATES OF THE NUMBER OF ADDITIONAL REPORTS AND AFFECTED FACILITIES

This chapter presents estimates of the number of additional reports on lead and lead compounds resulting from the final rule, as well as the number of affected facilities in each industry group expected to file these reports.[1] Numbers of facilities and reports are presented for each regulatory option. These estimates are used to estimate the costs to the regulated community and to EPA (see Chapter 4), to evaluate the impacts on small entities (see Chapter 5), and to discuss the potential benefits of the final rule (see Chapter 6). Section 3.1 presents the estimated number of additional reports. Section 3.2 presents the estimated number of affected facilities.

3.1 ESTIMATED NUMBER OF ADDITIONAL REPORTS

As discussed in Appendix A, the number of reports expected to be filed for lead and lead compounds by each industry group was estimated for four lower reporting thresholds for lead and lead compounds: 1 lb, 10 lbs, 100 lbs, and 1,000 lbs manufactured, processed, or otherwise used. In all cases, a best estimate was derived using the best available data.

The best estimate of the number of additional reports for lead and lead compounds is presented by option in Table 3-1. As described in Chapter 2, Option 1 corresponds with the lowest reporting threshold (1 lb), while Option 4 corresponds with the highest reporting threshold (1,000 lbs). As shown in both tables, the number of additional reports decreases as the reporting threshold increases. More extensive explanations of the data sources, methodologies, and calculations used to generate these estimates are provided in Appendix A.

[1] The term "affected facilities" is used in this report to denote facilities that meet the revised TRI reporting requirements and are expected to submit a Form R for lead and lead compounds. Additional facilities in an SIC code may be required to perform compliance determination activities if their industry group is subject to TRI reporting. A Form R is completed for a single chemical. Facilities may submit more than one Form R if they manufacture, process, or otherwise use more than one listed TRI chemical. The number of facilities performing compliance activities and the associated costs are estimated in Chapter 4.

TABLE 3-1
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD AND LEAD COMPOUNDS BY OPTION

Reporting Threshold Option	Number of Additional Reports
Option 1: 1 lb reporting threshold	21,587
Option 2: 10 lb reporting threshold	14,612
Option 3: 100 lb reporting threshold (selected)	9,813
Option 4: 1,000 lb reporting threshold	4,960

3.2 ESTIMATED NUMBER OF AFFECTED FACILITIES

By analyzing industry sectors from which reporting might potentially occur, the number of facilities expected to file a report for lead and lead compounds as a result of the final rule was estimated. Industry sectors potentially affected by the rule include:

- Metal mining (SIC code 10);
- Coal mining (SIC code 12);
- Manufacturing (SIC Codes 20-39);
- Electric utilities (coal and oil facilities only) (SIC codes 4911, 4931, 4939);
- Refuse systems (SIC code 4953);
- Bulk petroleum (SIC code 5171); and
- Solvent recovery services (SIC code 7389).

The methodology used to estimate the number of additional lead and/or lead compound reports is presented in Appendix A. Because each affected facility is required to file, at most, one report for lead and/or lead compounds, the number of *facilities* reporting in an industry group is equal to the number of *reports* estimated to be filed by that industry group. The number of facilities expected to report in each industry group as a result of the final rule is presented in Table 3-2.

To estimate the cost of the final rule it was also necessary to estimate the number of facilities filing their first TRI report as a result of the final rule. Specifically, calculation of total “rule familiarization” costs requires an estimate of the number of facilities that will be reporting to TRI for the first time as a result of the final rule, since only “first-time filers” will incur this cost (see Chapter 4). First-time filers may come from any of the industry sectors listed above. Within an industry sector it is assumed that additional reporting on lead and lead compounds resulting from the rule is expected to come first from current TRI filers (who file on other chemicals) and then from facilities that do not currently file any TRI reports. This assumption is thought to be reasonable given that, within an industry sector, current TRI filers are generally larger than non-TRI filers and are likely to have more throughput of materials that potentially contain lead and lead compounds.

In this analysis, the number of first-time filers is estimated by subtracting the number of current filers from the total number of filers expected under the lead rule in each SIC code. The number of current and first-time filers who file additional reports on lead and/or lead compounds as a result of the final rule is calculated separately for the following three types of filers:

- Manufacturing facilities filing an additional report due to combustion activities,
- Manufacturing facilities filing an additional report due to activities other than combustion, and
- Facilities in non-manufacturing SIC codes filing an additional report.

3.2.1 MANUFACTURING FACILITIES FILING AN ADDITIONAL REPORT DUE TO COMBUSTION ACTIVITIES

For manufacturers filing an additional report on lead and/or lead compounds due to combustion, the number of current TRI filers is calculated based on the estimated number of facilities reporting under the PBT rule due to combustion.[2] The approach used to estimate the number of manufacturing facilities expected to exceed the lower reporting thresholds for PBT chemicals as a result of combustion activities is described below (See Appendix A of the *Economic Analysis of the Final Rule to Modify Reporting of Persistent Bioaccumulative Toxic Chemicals Under EPCRA Section 313* for the derivation of combustion-related reports.):

- Select typical concentrations for each PBT chemical in the various fuels;

- Calculate the minimum annual throughput of various fuels needed to exceed each of the lower thresholds based on typical concentrations;

- Estimate the total number of manufacturing facilities expected to submit reports at each of the lower reporting thresholds based on fuel throughput.

For each reporting threshold, the number of first-time combustion filers under the lead rule is estimated by comparing the concentration of lead to the concentrations of PBT chemicals in each fuel type. As outlined above, the concentration of a chemical in a given fuel type is used to determine the fuel throughput required to exceed a reporting threshold for that chemical: the higher the concentration, the lower the fuel throughput required to exceed the reporting threshold. For each fuel type, the PBT chemical with the highest concentration, and therefore the lowest threshold exceeding throughput is identified. Next, the throughput for this PBT chemical is

[2]Since these facilities will file reports on PBT chemicals for the 2000 TRI reporting year, all of these facilities are considered to be current TRI filers for the purposes of this analysis. The additional lead and lead compound reports resulting from this rule will be filed in the 2001 TRI reporting year.

compared to the fuel throughput required to exceed the reporting threshold for lead. If, for a particular fuel, the throughput required to exceed a given threshold for lead is *less* than that for the PBT chemical, then the facilities that exceed the threshold for lead, but do not exceed the threshold for the PBT chemical, are considered first-time combustion filers under the lead rule. Therefore, for each fuel type, the number of first-time combustion filers under each option is estimated by subtracting the number of facilities submitting reports for the PBT chemical with the lowest threshold exceeding throughput from the number of facilities exceeding the threshold for lead. If for a given fuel, the threshold exceeding throughput for the PBT chemical is less than that for lead, then all facilities expected to report for lead would be currently reporting for that PBT chemical and there would be no first-time filers for lead as a result of combustion. Summing across fuel types yields the total number of first-time combustion filers under the lead rule.

To illustrate this methodology, an example of the estimation of the number of facilities expected to report to TRI for first-time as a result of the lead rule due to the combustion of coal is given below.

> A review of concentration data for all PBT chemicals in coal indicates that PACs have the highest concentration value and therefore, the lowest threshold exceeding throughput. The annual throughput of coal required to exceed the 10 lb reporting threshold for PACs is 19,231 tons per year based on a concentration of 0.00052 lbs of PACs per ton of coal.[3] The annual throughput of coal required to exceed the 100 lb reporting threshold for lead is 3,315 tons per year based on a concentration of 0.03 lbs of lead per ton of coal. All facilities with an annual throughput of coal greater than or equal to 3,315 tons but less than 19,231 tons would be expected to report for lead but would not be currently filing for any PBT chemical for the combustion of coal. Therefore, the number of first-time filers under the lead rule due to the combustion of coal is estimated by subtracting the number of facilities exceeding the reporting threshold for PACs from the number of facilities exceeding the threshold for lead. For example, 86 facilities in SIC code 20 are expected to submit TRI reports for lead due to the combustion of coal. Of these, 58 also exceed the reporting threshold for PACs due to the combustion of coal. Thus, the number of facilities from SIC code 20 expected to report to TRI for the first time under the lead rule due to the combustion of coal is 28 (86 - 58).

While there may be other facilities that will report on lead and/or lead compounds who currently report to TRI and *do not* report as a result of the PBT rule, it is not possible to identify these facilities based on 1998 TRI data. Because it is not possible to identify these facilities, the number of first-time combustion filers under the lead rule may be overstated.

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[3] The 10-lb threshold is used, since this is the current reporting threshold for PACs.

3.2.2 MANUFACTURING FACILITIES FILING AN ADDITIONAL REPORT DUE TO ACTIVITIES OTHER THAN COMBUSTION

For manufacturers filing an additional report due to non-combustion activities, current TRI filers are estimated based on the number of facilities reporting to TRI in 1998 on any other chemical in each manufacturing SIC code. There may also be facilities reporting on PBT chemicals due to activities other than combustion that would be considered current filers under the lead rule. It is not possible, however, to identify these filers at the 4-digit SIC code level and to compare them to estimates of lead filers that are at the 4-digit level. The number of first-time non-combustion filers under the lead rule is, therefore, estimated by subtracting the number of facilities reporting to TRI in 1998 from the number of facilities expected to report under the lead rule due to non-combustion activities. By not counting facilities reporting on PBT chemicals due to non-combustion activities as current filers, the number of first-time non-combustion filers under the lead rule may be further overstated.

3.2.3 FACILITIES IN NON-MANUFACTURING SIC CODES FILING A LEAD REPORT

For non-manufacturing SIC codes, the number of current filers within a SIC code is estimated based on the number of non-manufacturing facilities that report to TRI in either the 1998 reporting year or following the first year of PBT reporting, whichever is larger. In the economic analysis of the PBT rule, it was assumed that facilities in non-manufacturing SIC codes filing PBT reports would already be reporting to TRI for one or more chemicals. The first year of TRI data for non-manufacturing facilities did not become available until after the PBT rule was promulgated. A comparison of 1998 TRI filers and estimated PBT filers indicates that, in certain non-manufacturing SIC codes, not all estimated PBT filers already report to TRI. Thus, some facilities are expected to report to TRI for the first time due to the PBT rule. For those SIC codes where the estimate of facilities filing due to the PBT rule is larger than the number of non-manufacturing facilities filing in 1998, the number of current filers assumed for the lead rule is equal to the estimated number of PBT filers. For those SIC codes where the number of non-manufacturing facilities filing in 1998 is greater than the estimated number of PBT filers, the number of current filers assumed for the lead rule is equal to the number of 1998 non-manufacturing filers. The number of first-time filers in non-manufacturing SIC codes under the lead rule is then estimated by subtracting either the number of non-manufacturing facilities filing in 1998 or the number of estimated PBT filers in non-manufacturing SIC codes from the number of facilities in non-manufacturing SIC codes expected to report under the lead rule. Table 3-2 presents the number of facilities, first-time filers, and additional reports by industry group and by option. Figure 3-1 shows the total number of current and first-time filers by option.

FIGURE 3-1
NUMBER OF CURRENT AND FIRST-TIME FILERS BY REPORTING THRESHOLD

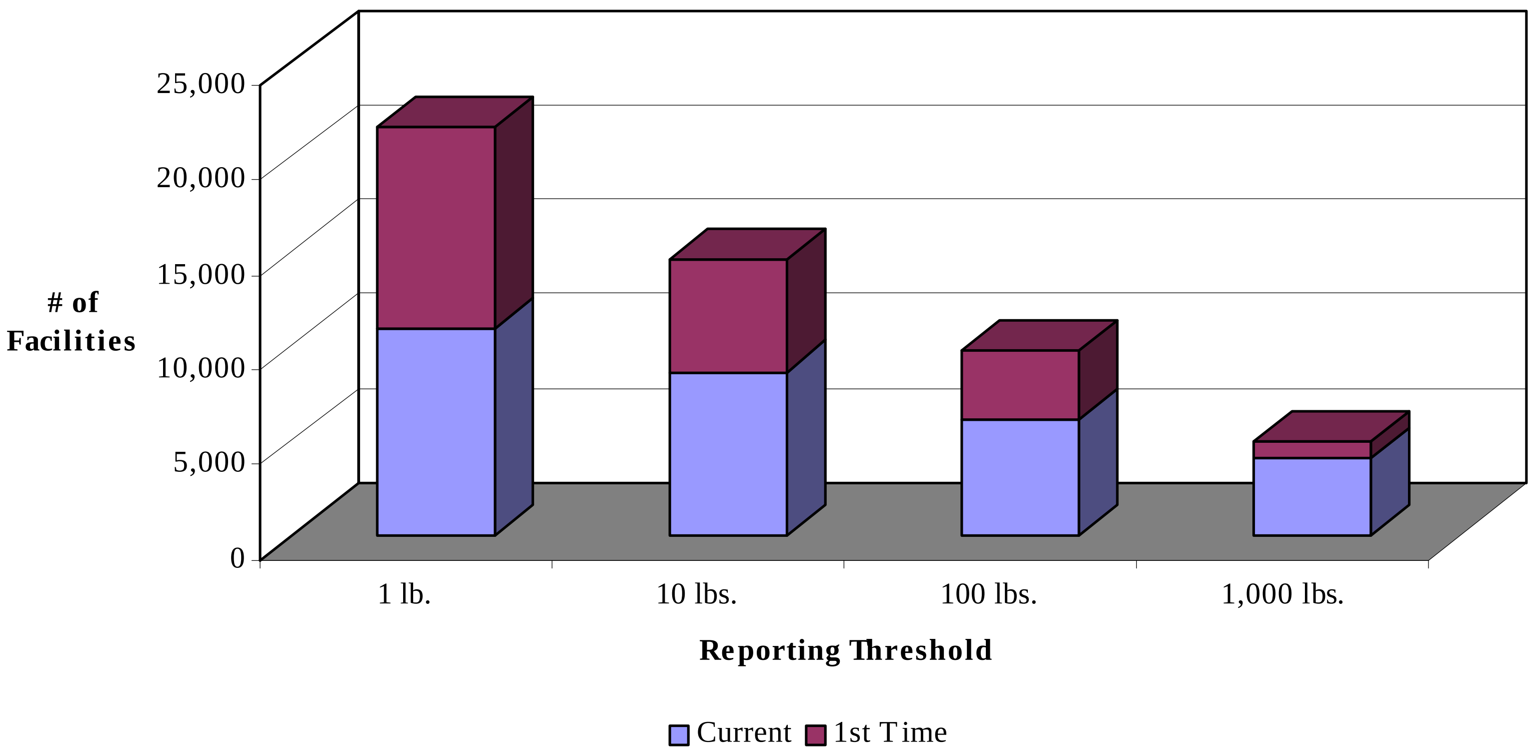

TABLE 3-2
NUMBERS OF FACILITIES AND ADDITIONAL REPORTS ASSOCIATED WITH LEAD AND LEAD COMPOUNDS BY INDUSTRY GROUP

	Option 1			Option 2			Option 3 (Selected Option)			Option 4		
Industry Group	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports
10 - Metal mining	127	33	127	127	33	127	127	33	127	127	33	127
12 - Coal mining	314	0	314	314	0	314	314	0	314	314	0	314
20 - Food	1,337	942	1,337	1,110	715	1,110	291	0	291	120	0	120
21 - Tobacco	66	42	66	48	24	48	29	5	29	14	0	14
22 - Textiles	582	274	582	382	74	382	184	0	184	79	0	79
23 - Apparel	218	196	218	91	69	91	16	0	16	4	0	4
24 - Lumber	2,167	1,312	2,167	860	5	860	107	0	107	17	0	17
25 - Furniture	221	0	221	127	0	127	60	0	60	28	0	28
26 - Paper	637	543	637	416	322	416	211	117	211	94	0	94
27 - Printing	489	249	489	212	0	212	41	0	41	11	0	11
28 - Chemicals	945	0	945	652	0	652	497	0	497	360	0	360
29 - Petroleum	1,037	835	1,037	150	0	150	95	0	95	94	0	94
30 - Plastics	426	0	426	233	0	233	84	0	84	33	0	33
31 - Leather	70	0	70	43	0	43	18	0	18	7	0	7
32 - Stone/clay/glass	1,083	894	1,083	519	330	519	186	0	186	177	0	177
33 - Primary metals	2,182	850	2,182	2,182	850	2,182	1,945	613	1,945	1,044	0	1,044
34 - Fabricated metals	764	0	764	443	0	443	267	0	267	193	0	193
35 - Machinery	709	0	709	301	0	301	53	0	53	14	0	14
36 - Electrical equip.	4,008	3,333	4,008	3,998	3,323	3,998	3,501	2,826	3,501	1,483	808	1,483
37 - Transportation equip.	347	0	347	347	0	347	347	0	347	14	0	14

TABLE 3-2, CONT'D.
NUMBERS OF FACILITIES AND ADDITIONAL REPORTS ASSOCIATED WITH LEAD AND LEAD COMPOUNDS BY INDUSTRY GROUP

	Option 1			Option 2			Option 3 (Selected Option)			Option 4		
Industry Group	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports	Total Number of Facilities	Number of First-Time Filers	Number of Reports
38 - Measure./photo.	196	0	196	75	0	75	7	0	7	0	0	0
39 - Miscellaneous	332	319	332	176	163	176	58	45	58	30	17	30
4911 - Electric services (coal and oil facilities only)	356	0	356	335	0	335	301	0	301	258	0	258
4931 - Electric & other services (coal and oil facilities only)	275	10	275	264	0	264	246	0	246	224	0	224
4939 - Combination utilities (coal and oil facilities only)	30	1	30	29	0	29	27	0	27	24	0	24
4953 - Refuse systems	107	0	107	107	0	107	107	0	107	107	0	107
5171 -Bulk petroleum	2,454	749	2,454	975	0	975	616	0	616	50	0	50
7389 - Solvent recovery services	108	12	108	96	0	96	78	0	78	40	0	40
TOTAL	**21,587**	**10,594**	**21,587**	**14,612**	**5,908**	**14,612**	**9,813**	**3,639**	**9,813**	**4,960**	**858**	**4,960**

CHAPTER 4
COST ESTIMATES

This chapter describes the methodology used to estimate the costs that industry and EPA are expected to incur as a result of the final rule. Section 4.1 describes the methodology used to estimate the total industry costs. Section 4.2 details the estimated costs to EPA of implementing the expanded program. Section 4.3 summarizes the total costs.

4.1 INDUSTRY COST ESTIMATES

In this section, the costs that may be incurred by industry as a result of modifying TRI reporting requirements are estimated. These costs are presented for the selected option as well as for three additional regulatory options. Section 4.1.1 describes the methodology used to estimate total industry costs for each option. Section 4.1.2 discusses the unit cost estimates for each of the activities that a facility may need to perform to comply with the section 313 reporting requirements. Section 4.1.3 presents the total cost estimate of each option for industry. Section 4.1.4 discusses the costs incurred by publicly-owned facilities. Finally, Section 4.1.5 describes the transfer payments and non-monetized costs associated with this rulemaking.

4.1.1 METHODOLOGY

Total industry costs were calculated using the following four-step procedure:

Step 1: Identify and describe the tasks that facilities will have to perform to comply with the section 313 requirements.

Step 2: Estimate the typical number of hours of managerial, technical, and clerical labor needed to complete each task. Based on typical labor rates, calculate the unit cost of each task for the first year of compliance, when some learning must take place, and subsequent years, when less time is needed because facilities are more familiar with the tasks.

Step 3: Estimate the number of unique facilities that will perform each task. Estimate the number of facilities that will perform some portion of the required tasks in order to determine that they do not have to comply with the reporting requirements. Estimate the number of reports to be filed in each industry group.

Step 4: For each task, multiply the unit cost by the number of unique facilities and/or reports, and then sum the results to compute the total industry costs for the first year and subsequent years.

The tasks associated with TRI reporting under the final lead rule include:

- **Compliance Determination:** Facilities must determine whether they meet the criteria for reporting on lead and lead compounds at the lower thresholds. This task includes the time required to become familiar with the definitions, exemptions, and new threshold requirements under the TRI program and to conduct preliminary threshold calculations to determine if the facility is required to report.
- **Rule Familiarization:** Facilities that are reporting under section 313 for the first time due to the final rule must read the reporting package and become familiar with the reporting requirements.
- **Report Completion:** Facilities must gather data and perform calculations to provide the information required on the form.
- **Mailing and Recordkeeping:** Facilities must maintain recordkeeping systems and mail the report to EPA and the state.

The skills required to comply with the section 313 reporting requirements (including the requirements associated with section 6607 of the PPA) will vary from facility to facility depending upon factors such as the complexity of the facility's processes, the type of use and disposition of lead and lead compounds at the facility, and transfers from the facility. Those responsible for reporting may often have engineering, scientific, or technical backgrounds. Compliance does not, however, necessarily require an engineering or other similar degree. At a minimum, an understanding of the facility's chemical purchases and production processes is required. Necessary skills may include the ability to evaluate and interpret records, understand material safety data sheets, and determine throughput or production volumes. Depending on the facility, estimates may be calculated using existing data collected under federal, state, or local regulations; emissions factors; design data supplied by the equipment manufacturer; mass balance techniques; or engineering calculations. Each technique requires varying skills and levels of sophistication to complete. In some instances, EPA guidance documents may supplant the need for a particular skill.

The next section discusses how the unit cost associated with each of these specific tasks was estimated.

4.1.2 UNIT COST ESTIMATES

This section explains how the cost estimates, or unit costs, were developed for each task that facilities might have to perform under the final rule. Depending on whether the unit cost is report- or facility-specific, total costs for a task can be calculated by multiplying the unit cost by the number of reports for which the task must be performed or by the number of facilities performing it. The estimated number of unique facilities and lead reports expected under each regulatory option is presented in Table 4-1. The estimated unit cost for each of the tasks is presented in Table 4-2.

Each cost estimate is made up of two components: the unit time estimates (i.e., number of labor hours required of each type of personnel to complete a task); and the hourly wage rates for each level of personnel. The unit time estimates are taken from the Economic Analysis (EA) of the Final Rule to Add Certain Industry Groups to EPCRA Section 313 (USEPA, 1997).

Hourly wage rates are divided into three categories: managerial, technical, and clerical. Updated 1998 hourly labor rates, including fringe benefits and overhead, were developed by EPA for each of these categories using the same methodology used in the Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313 (USEPA, 1997). The new wage rates were calculated using current data on salaries and benefits for these three labor categories.

Wage data used in developing the basic wage rates for this analysis were derived from 1996 wage information published by the Bureau of Labor Statistics (BLS) for all goods-producing, private industries (USDL, 1998). The managerial, technical, and clerical wage rates are based on wage information for four BLS occupation categories: engineers, accountants, attorneys, and secretaries. As presented in Table 4-3, the managerial and technical level wage rates are composites of the BLS wage rates for several occupation categories and levels. The managerial level wage rate is a composite of the wage rates of Engineers (levels VI-VIII), Accountants (levels V-VI), and Attorneys (levels IV-VI).[1] The technical level wage is a composite of the wage rates of Engineers (levels III-VIII) and Accountants (levels (III-VI).[2] The clerical wage rate is an average of all the clerical wage levels provided by BLS (i.e., levels I-V).

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[1]Managerial labor is assumed to be composed of operational labor, including engineers or chemists at the plant manager, facility research manager, or higher levels, legal managers, and financial managers.

[2]Technical labor is assumed to be composed of operational labor, including senior engineers or chemists equivalent to head process or project engineer, and financial labor, such as accountants. It is assumed that operational labor is used at a five-to-one ratio with financial labor.

TABLE 4-1
ESTIMATED NUMBER OF UNIQUE FACILITIES AND LEAD REPORTS UNDER THE FINAL LEAD RULE

	Option 1	Option 2	Option 3 (Selected Option)	Option 4
SIC Code	Number of Facilities and Reports	Number of Facilities and Reports	Number of Facilities and Reports	Number of Facilities and Reports
10 - Metal mining	127	127	127	127
12 - Coal mining	314	314	314	314
20 - Food	1,337	1,110	291	120
21 - Tobacco	66	48	29	14
22 - Textiles	582	382	184	79
23 - Apparel	218	91	16	4
24 - Lumber	2,167	860	107	17
25 - Furniture	221	127	60	28
26 - Paper	637	416	211	94
27 - Printing	489	212	41	11
28 - Chemicals	945	652	497	360
29 - Petroleum	1,037	150	95	94
30 - Plastics	426	233	84	33
31 - Leather	70	43	18	7
32 - Stone/clay/glass	1,083	519	186	177
33 - Primary metals	2,182	2,182	1,945	1,044
34 - Fabricated metals	764	443	267	193
35 - Machinery	709	301	53	14
36 - Electrical equip.	4,008	3,998	3,501	1,483
37 - Transportation equip.	347	347	347	14
38 - Measure./photo.	196	75	7	0
39 - Miscellaneous	332	176	58	30
4911 - Electric services (coal and oil facilities only)	356	335	301	258
4931 - Electric & other services (coal and oil facilities only)	275	264	246	224
4939 - Combination utilities (coal and oil facilities only)	30	29	27	24
4953 - Refuse systems	107	107	107	107
5171 -Bulk petroleum	2,454	975	616	50
7389 - Solvent recovery services	108	96	78	40
TOTAL	**21,587**	**14,612**	**9,813**	**4,960**

TABLE 4-2
UNIT TIME AND COST ESTIMATES FOR ACTIVITIES PERFORMED BY INDUSTRY UNDER THE FINAL LEAD RULE

Activity	Unit Time Estimates (Hours) (per report or per facility)			Unit Cost[a] (1998 Dollars)
	Managerial	Technical	Clerical	
First Year				
Rule Familiarization[b]	12.0	22.5	0.0	$2,489
Compliance Determination[b,c]	4.0	12.0	0.0	$1,119
Form R Completion[d]	20.9	45.2	2.9	$4,796
Recordkeeping/Mailing[d]	0.0	4.0	1.0	$283
Subsequent Years				
Compliance Determination[b,c]	1.0	3.0	0.0	$280
Form R Completion[d]	14.3	30.8	2.0	$3,274
Recordkeeping/Mailing[d]	0.0	4.0	1.0	$283

[a] Cost per lead report, based on loaded hourly wage rates of $86.86, $64.30, and $25.63 for managerial, technical, and clerical labor, respectively.

[b] The unit cost for this activity is estimated at the facility level. It is treated as a fixed cost that does not vary with the number of chemicals handled or reported by a facility.

[c] The compliance determination unit cost used in this analysis is adjusted by the compliance determination weighting factor shown in Table 4-5. This unit cost shown above is for the entire list of TRI chemicals. The incremental compliance determination burden and cost for lead and lead compounds used in this analysis are 0.40 hours of management time and 1.20 hours of technical time, or $112 in the first year. In the second year, burden and cost are 0.10 hours of management time and 0.30 hours of technical time, or $28.

[d] The unit cost for this activity is estimated at the report level.

Sources: U.S.EPA (1997). *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313 Reporting*. April.

TABLE 4-3
LOADED HOURLY WAGE RATES BY LABOR CATEGORY

Labor Category	Occupation (levels)	June 1996 Average Salary	Weighting Factor	1996 Composite Salary	ECI Ratio 6/96:3/98	1998 Adjusted Salary	1997 Benefits (% Salary)	Overhead (%Salary)	1998 Loaded Annual Salary	1998 Loaded Hourly Rate
	Engineer (VI-VIII)	$104,971	10/17	$61,748						
	Attorney (IV-VI)	$116,255	5/17	$34,193						
	Accountant (V-VI)	$82,030	2/17	$9,651						
Managerial	Composite			$105,592	1.087	$114,779	40.4%	17.0%	$180,662	$86.86
	Engineer (III-VIII)	$83,243	5/6	$69,369						
	Accountant (III-VI)	$65,780	1/6	$10,963						
Technical	Composite			$80,332	1.055	$84,750	40.8%	17.0%	$133,736	$64.30
Clerical	Secretarial (I-V)	$31,502	1/1	$31,502						
	Composite			$31,502	1.063	$33,487	42.2%	17.0%	$53,311	$25.63

[a] Composite Salaries are determined by multiplying average salaries by the weighting factor and summing across occupations.

Sources: U.S. Department of Labor, Bureau of Labor Statistics. Occupational Compensation Survey, National Summary 1996 (1998). U.S. Department of Labor, Washington, D.C., March. Bulletin 2497, Tables A-1, D-1 and D-3, 1998.
U.S. Department of Labor, Bureau of Labor Statistics. Employer Costs for Employee Compensation — March 1997. U.S. Department of Labor, Washington D.C., October 21. USDL News Release: 97-371, Table 11, 1997
U.S. Department of Labor, Bureau of Labor Statistics (1998). Employment Cost Index—March 1998. U.S. Department of Labor, Washington D.C., April 30. USDL News Release 98-170, Table 6, 1998.

The weighting factors used to develop the managerial and technical wage rates are based on information provided by the chemical industry and chemical industry trade associations on the typical fraction of total reporting effort that is accounted for by each specific BLS occupation category.[3]

The 1996 composite annual salary estimates were adjusted to first-quarter 1998 dollars using the Employment Cost Index (ECI) for white-collar occupations in private industries (US DL, 1998). The 1998 adjusted, composite salary for the managerial, technical, and clerical labor categories was then multiplied by benefits and overhead factors to estimate a 1998 loaded, annual salary. Detailed benefits data for white-collar occupations in private, goods-producing industries were used to account for the additional cost of benefits for managerial, technical, and clerical labor (USDL, 1998). The overhead factor of 17 percent is based on information provided by the chemical industry and chemical industry trade associations. The loaded annual salary was then divided by 2,080 hours (i.e., the average annual number of hours for a full-time employee) to derive the loaded, hourly wage rates used in this analysis for each labor category. The hourly wage rates are \$86.86 for managerial personnel, \$64.30 for technical personnel, and \$25.63 for clerical personnel, all in 1998 dollars.

The remainder of this section discusses the costs associated with each specific industry task. Activities are organized into two categories: per facility costs and per report costs. As noted previously, these costs are summarized in Table 4-2.

Per Facility Costs

Compliance Determination

Under the final rule, a facility must report under section 313 if it: (a) is within SIC codes covered by the TRI program; (b) has 10 or more employees or the equivalent of 10 full-time employees; and (c) manufactures, processes, or uses lead or lead compounds above the final threshold quantity. All facilities in TRI covered industry groups must determine if they meet these criteria. It is assumed that facilities will not incur any incremental costs to make determinations regarding the first two criteria. The third determination, however, would require the management and technical staff to determine whether lead and/or lead compounds are manufactured, processed, or otherwise used above threshold levels.

The estimated number of facilities performing a compliance determination in the first year and in subsequent years in each of the SIC codes and/or industry groups is presented in Table 4-4. For all industry groups, the number of facilities performing compliance determinations corresponds to the estimated number of facilities in each industry group with 10 or more full-time employees. The total number of facilities for each industry group was taken from information

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[3]The current methodology does not include chemists in estimating the composite wage rates because updated information on wage levels for chemists was not available from BLS. The Engineer salary information is expected to be similar to Chemist salary information. In addition, BLS data for Level VI attorneys in goods-producing industries were not available, so wages for all private industry level VI attorneys were used instead.

collected by the US Department of Commerce (USDOC, 1997) and from the economic analysis of the final rule to add certain industry groups to EPCRA section 313 reporting (USEPA, 1997).

TABLE 4-4
NUMBER OF FACILITIES CONDUCTING COMPLIANCE DETERMINATIONS
ALL OPTIONS

SIC Code	**First and Subsequent Years**
10 - Metal mining	268
12 - Coal mining	1,749
20 - Food	12,917
21 - Tobacco	97
22 - Textiles	3,978
23 - Apparel	11,780
24 - Lumber	13,620
25 - Furniture	6,120
26 - Paper	5,389
27 - Printing	22,834
28 - Chemicals	7,516
29 - Petroleum	993
30 - Plastics	11,790
31 - Leather	874
32 - Stone/clay/glass	8,846
33 - Primary metals	4,935
34 - Fabricated metals	23,497
35 - Machinery	26,359
36 - Electrical equip.	10,690
37 - Transportation equip.	6,552
38 - Measure./photo.	6,438
39 - Miscellaneous	6,520
4911/4931/4939—Electric services; Electric & other services; combination utilities (coal and oil facilities only)	1,027
4953 - Refuse systems	162
5169 - Chemical wholesalers	2,801
5171 -Bulk petroleum	3,842
7389 - Solvent recovery services	191
TOTAL	**201,785**

To make the compliance determination, a facility must first review whether it manufactures, processes, or otherwise uses lead and lead compounds in any quantity. If it does, then it must make a threshold determination to ascertain whether it manufactures, processes, or uses more than the threshold amount of lead and lead compounds. Since lead and lead compounds are considered to be a persistent and bioaccumulative chemical, the preferred reporting threshold presented in the regulatory text is 100 pounds manufactured, processed, or otherwise used. Taken together with other changes to the reporting requirements, such as elimination of the *de minimis* exemption and alternate reporting threshold, the 100-pound reporting threshold forms the selected option.

In the Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313 (hereafter known as the industry expansion EA), it was estimated that compliance determination would require one hour of managerial time and three hours of technical time to complete the compliance determination in subsequent years (USEPA, 1997). In the industry expansion EA it was also assumed that facilities would require four times as many labor hours to complete a compliance determination in the first year compared to subsequent years (USEPA, 1997). Applying this four-fold factor yields estimates of four hours of managerial time and twelve hours of technical time per facility to make the compliance determination in the first year.

In both first and subsequent years, it is unclear whether making a compliance determination for lead and lead compounds would be harder than, easier than, or equally as difficult as making the determination for the current list of over 600 chemical and chemical compounds. Compliance determination might be more complicated in situations where lead or lead compounds are a byproduct or an impurity of a facility's main production processes, or are produced inadvertently outside a facility's main production processes. By contrast, for very low thresholds it may be easy for facilities to ascertain that they manufacture, process or use lead and lead compounds in at least some quantity. To generate an extremely precise burden estimate for compliance determination, the particular circumstances at each facility using lead and lead compounds would have to be known. Such a detailed understanding of per facility chemical usage was not possible for this analysis. Therefore, it is assumed that the average time needed by a facility for compliance determination will be proportional to the total number of reports submitted by all facilities for lead and lead compounds in the first year and in all subsequent years. The estimated number of new reports per SIC code under the selected option (Option 3) as well as the other three options is shown in Table 4-1. The ratio of new reports expected under the final lead rule to total reports before the final lead rule under current reporting requirements is used as a weighting factor to adjust the unit cost estimate for compliance determination. The adjusted unit cost estimates for each of the options in first and subsequent years is presented in Table 4-5.

TABLE 4-5
ADJUSTED UNIT COSTS FOR COMPLIANCE DETERMINATION BY OPTION

	Expected Number of Lead Reports	Total Number of Reports[4]	Weighting Factor	Adjusted Unit Cost for Compliance Determination
FIRST YEAR				
Option 1	21,587	102,851	.21	$234.99
Option 2	14,612	102,851	.14	$156.66
Option 3 (selected)	9,813	102,851	.10	$111.90
Option 4	4,960	102,851	.05	$55.96
SUBSEQUENT YEAR				
Option 1	21,587	102,851	.21	$58.80
Option 2	14,612	102,851	.14	$39.20
Option 3 (selected)	9,813	102,851	.10	$28.00
Option 4	4,960	102,851	.05	$14.00

To calculate the incremental cost of compliance determination for the final lead rule by industry group, the adjusted unit compliance cost is multiplied by the number of facilities in the industry group with more than 10 FTEs.

Rule Familiarization

If a facility will be reporting under the section 313 requirements for the first time due to the final lead rule, facility staff must review and comprehend the reporting requirements. At a minimum, this effort will involve reading the instructions to the Toxic Chemical Release Inventory Reporting Form R, however, it may also involve consulting EPA guidance documents, attending a training course, and/or calling the EPCRA technical hotline. The cost associated with rule familiarization occurs only in the first year that a facility becomes subject to reporting. In subsequent years, staff are assumed to be familiar with the requirements that apply to their facility. Thus, the facility would no longer bear this cost. Similarly, facilities reporting on lead and lead compounds that already report on one or more existing TRI chemicals will not incur a rule familiarization cost.

It is estimated that facilities reporting under section 313 for the first time will need to make a one-time expenditure of 34.5 hours for rule familiarization. This burden estimate is comprised of 12 hours of management time and 22.5 hours of technical time (USEPA, 1997). As mentioned in Chapter 3, within an industry sector it is assumed that additional reporting on lead

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[4] In 1998, 87,329 reports were submitted to TRI. In addition, an estimated 15,522 reports will be submitted by industries affected by the PBT Rule. As a result, the total number of reports is estimated to be 102,851.

and lead compounds resulting from the final rule is expected to come first from current TRI filers (who file on other chemicals) and then from facilities that do not currently file any TRI reports. This assumption is thought to be reasonable given that, within an industry sector, current TRI filers are generally larger than non-TRI filers and are likely to have more throughput of materials that potentially contain lead and lead compounds. For each SIC code, the number of first-time lead filers is calculated separately for the following three types of filers:

- **Manufacturing facilities filing a lead report due to combustion activities** - the number of first-time combustion filers under the lead rule is estimated by subtracting the number of facilities submitting reports for PBT chemicals with the lowest threshold exceeding throughput from the number of facilities expected to file additional reports under the final rule due to combustion. (See Section 3.2.1 for a detailed description of the derivation of first-time filers due to combustion.)

- **Manufacturing facilities filing a lead report due to activities other than combustion -** the number of first-time non-combustion filers under the lead rule is estimated by subtracting the number of facilities reporting to TRI in 1998 from the number of facilities expected to file additional reports under the final rule due to non-combustion activities.

- **Facilities in expansion SIC codes filing a lead report** - the number of first-time filers in non-manufacturing SIC codes under the final rule is estimated by subtracting either the number of non-manufacturing facilities filing in 1998 or the number of estimated PBT filers in non-manufacturing SIC codes (whichever is larger) from the number of facilities in expansion SIC codes expected to report under the lead rule.

Since the cost and small-entity analyses are conducted at the 2-digit SIC code level for manufacturers, the number and percent of first-time filers for manufacturing SIC codes is estimated at the 2-digit level using only the 4-digit SIC codes from which reports are expected under the rule. For the expansion SIC codes, the number and percent of first-time filers is estimated at the level they were added to TRI (i.e., 10, 12, 4911, 4931, 4939, 4953, 5171, 7389). The cost of rule familiarization is then calculated by applying the unit cost as shown in Table 4-2 to the number of first-time filers in each SIC code presented in Table 4-6.

TABLE 4-6
NUMBER OF UNIQUE FACILITIES AND FIRST-TIME FILERS EXPECTED TO FILE ADDITIONAL REPORTS UNDER THE FINAL LEAD RULE

	Option 1			Option 2			Option 3 (Selected)			Option 4		
	Unique Number of Facilities Expected to File Additional Reports	Number of Current TRI Filers	Number of First-Time Filers	Unique Number of Facilities Expected to File Additional Reports	Number of Current TRI Filers	Number of First-Time Filers	Unique Number of Facilities Expected to File Additional Reports	Number of Current TRI Filers	Number of First-Time Filers	Unique Number of Facilities Expected to File Additional Reports	Number of Current TRI Filers	Number of First-Time Filers
10 - Metal mining	127	94	33	127	94	33	127	94	33	127	94	33
12 - Coal mining	314	314	0	314	314	0	314	314	0	314	314	0
20 - Food	1,337	395	942	1,110	395	715	291	291	0	120	120	0
21 - Tobacco	66	24	42	48	24	24	29	24	5	14	14	0
22 - Textiles	582	308	274	382	308	74	184	184	0	79	79	0
23 - Apparel	218	22	196	91	22	69	16	16	0	4	4	0
24 - Lumber	2,167	855	1,312	860	855	5	107	107	0	17	17	0
25 - Furniture	221	221	0	127	127	0	60	60	0	28	28	0
26 - Paper	637	94	543	416	94	322	211	94	117	94	94	0
27 - Printing	489	240	249	212	212	0	41	41	0	11	11	0
28 - Chemicals	945	945	0	652	652	0	497	497	0	360	360	0
29 - Petroleum	1,037	202	835	150	150	0	95	95	0	94	94	0
30 - Plastics	426	426	0	233	233	0	84	84	0	33	33	0
31 - Leather	70	70	0	43	43	0	18	18	0	7	7	0
32 - Stone/clay/glass	1,083	189	894	519	189	330	186	186	0	177	177	0
33 - Primary metals	2,182	1,332	850	2,182	1,332	850	1,945	1,332	613	1,044	1,044	0
34 - Fabricated metals	764	764	0	443	443	0	267	267	0	193	193	0
35 - Machinery	709	709	0	301	301	0	53	53	0	14	14	0
36 - Electrical equip.	4,008	675	3,333	3,998	675	3,323	3,501	675	2,826	1,483	675	808
37 - Transportation equip.	347	347	0	347	347	0	347	347	0	14	14	0
38 - Measure./photo.	196	196	0	75	75	0	7	7	0	0	0	0

TABLE 4-6, CONT'D.
NUMBER OF UNIQUE FACILITIES AND FIRST-TIME FILERS UNDER THE FINAL LEAD RULE

	Option 1			Option 2			Option 3 (Selected)			Option 4		
	Unique Number of Facilities Expected to File Additional Reports	**Number of Current TRI Filers**	**Number of First-Time Filers**	**Unique Number of Facilities Expected to File Additional Reports**	**Number of Current TRI Filers**	**Number of First-Time Filers**	**Unique Number of Facilities Expected to File Additional Reports**	**Number of Current TRI Filers**	**Number of First-Time Filers**	**Unique Number of Facilities Expected to File Additional Reports**	**Number of Current TRI Filers**	**Number of First-Time Filers**
39 - Miscellaneous	332	13	319	176	13	163	58	13	45	30	13	17
4911 - Electric services (coal and oil facilities only)	356	356	0	335	335	0	301	301	0	258	258	0
4931 - Electric & other services (coal and oil facilities only)	275	265	10	264	264	0	246	246	0	224	224	0
4939 - Combination utilities (coal and oil facilities only)	30	29	1	29	29	0	27	27	0	24	24	0
4953 - Refuse systems	107	107	0	107	107	0	107	107	0	107	107	0
5171 -Bulk petroleum	2,454	1,705	749	975	975	0	616	616	0	50	50	0
7389 - solvent recovery services	108	96	12	96	96	0	78	78	0	40	40	0
TOTAL	**21,587**	**10,993**	**10,594**	**14,612**	**8,704**	**5,908**	**9,813**	**6,174**	**3,639**	**4,960**	**4,102**	**858**

Per Report Costs

Form R Completion

Given the persistent, bioaccumulative, and toxic nature of lead and lead compounds, facilities will not be able to take advantage of the alternate manufacture, process, or otherwise use threshold of one million pounds under the final lead rule. All facilities filing reports on lead and lead compounds at the lower reporting thresholds must use the Form R.

Facilities that determine they must report on lead and lead compounds under the section 313 reporting requirements will incur costs to retrieve, process, review, and transcribe the information necessary to complete each report. Most of the time spent on form completion is used to calculate releases, transfers, and other waste management information; relatively little time is required to copy information to the form. Form R completion will require more time in the first year than in subsequent years. In subsequent years, facilities will need to verify and update data, review previous calculations, and modify the information reported on the previous year's Form R, rather than estimate or retrieve data for the first time.

The estimated time for Form R completion equals 47 hours (14.3 hours of managerial, 30.8 hours of technical, and 2 hours of clerical time) (USEPA, 1997). This estimate represents a “subsequent-year” burden, because facilities already have experience preparing the form.

Following the methodology employed in the industry expansion EA, in order to estimate the report completion time for the first year, the subsequent-year burden was multiplied by the ratio of first-year cost to subsequent-year cost (USEPA, 1997). The time required to complete a report in the first year is estimated to be 147 percent of the time required in subsequent years. Applying this factor to the report completion estimate above, the time estimate required for reporting in the first year is 69.1 hours per report. Assuming the same labor mix indicated in the industry expansion EA, the 69.1 hours is assumed to be comprised of 20.9 hours of management time, 45.2 hours of technical time, and 2.9 hours of clerical time.

The estimated number of reports to be filed by each industry is indicated in Table 4-1 for each option. The total cost associated with Form R completion is calculated by multiplying the unit cost indicated in Table 4-2 by the number of expected reports under each option.

Mailing and Recordkeeping

After a facility has completed the form, it incurs additional labor costs for recordkeeping associated with filing a Form R. Recordkeeping allows a facility to use the information in making calculations in subsequent years, and as documentation in the event it receives a compliance audit. Facilities must maintain records such as estimation methodology and calculations, engineering reports, inventory, incident and operating logs, and any other supporting materials needed to provide the information required on the Form R.

Mailing and recordkeeping require five hours per Form R (four hours of technical and one hour of clerical time)(USEPA, 1997). Recordkeeping and mailing costs are not expected to vary between the first and subsequent years. Therefore, the five hours per Form R is assumed for both first and subsequent years. The estimated number of reports requiring recordkeeping and mailing is identical to the number of Form Rs expected to be filed as presented in Table 4-1. Appendix A describes how the number of reports was estimated for each industry group.

4.1.3 TOTAL INDUSTRY COSTS

The total industry costs associated with the final lead rule include the costs of rule familiarization, compliance determination, Form R completion, recordkeeping, and mailing. To compute the industry-wide cost of each compliance activity, the unit cost for each task is multiplied by the relevant number of facilities and/or reports associated with that task. Figure 4-1 shows the relative contribution of each cost component to total cost for the first and subsequent years across options. Tables 4-7a and 4-7b present the total cost of the final lead rule in the first and subsequent years for the affected industry groups under Option 1. Tables 4-8a and 4-8b present the total cost in the first and subsequent years under Option 2. Tables 4-9a and 4-9b present the total cost in the first and subsequent years under the selected option: Option 3. Finally, Tables 4-10a and 4-10b present the total cost in the first and subsequent years under Option 4.

FIGURE 4-1
TOTAL COST BY COMPLIANCE ACTIVITY AND REPORTING THRESHOLD

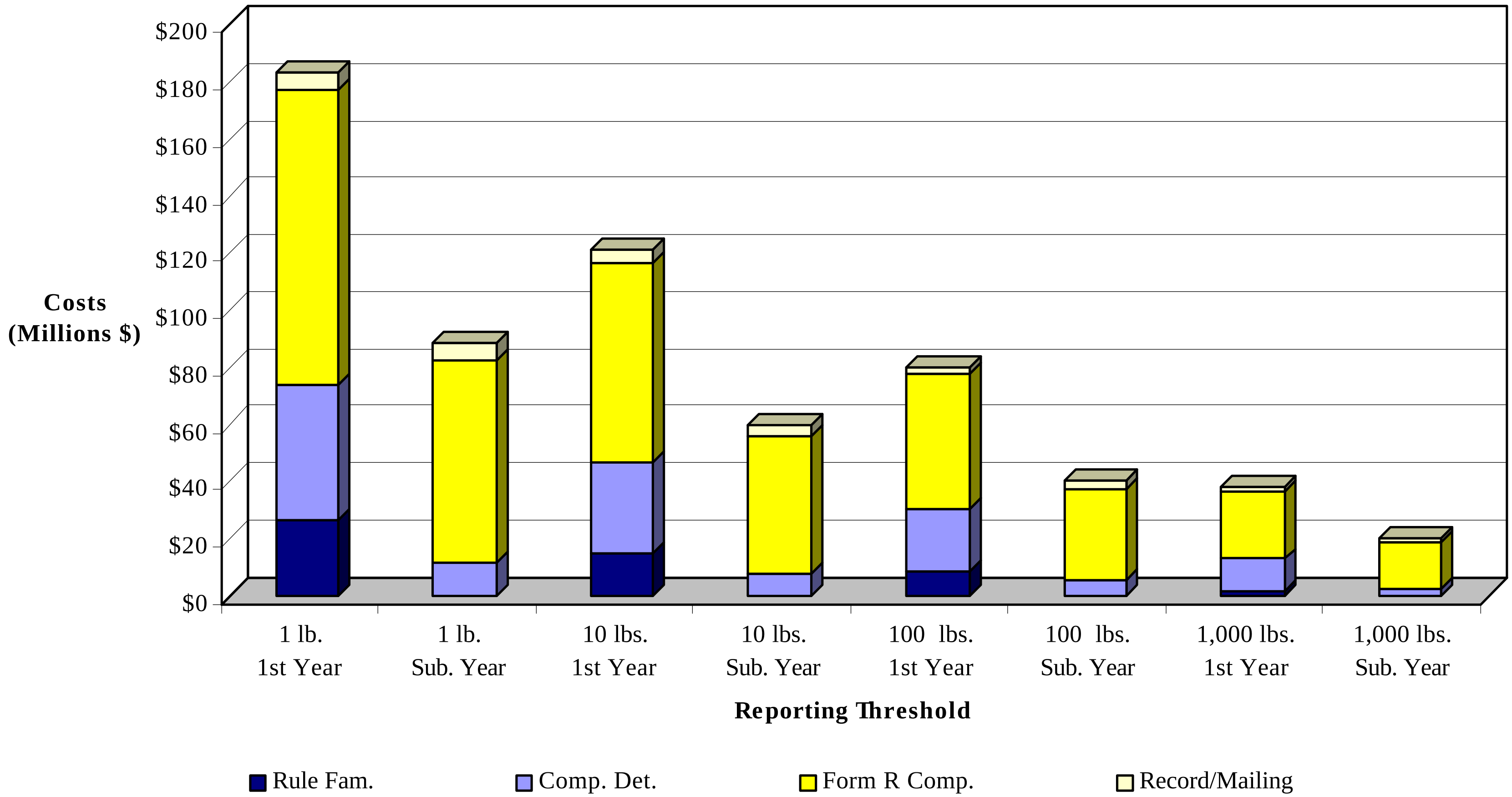

TABLE 4-7a
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 1 — FIRST YEAR
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$82	$63	$609	$36	$790
12 - Coal mining	$0	$411	$1,506	$89	$2,006
20 - Food	$2,345	$3,034	$6,412	$378	$12,169
21 - Tobacco	$105	$23	$317	$19	$463
22 - Textiles	$682	$934	$2,791	$165	$4,572
23 - Apparel	$488	$2,767	$1,046	$62	$4,362
24 - Lumber	$3,266	$3,199	$10,393	$613	$17,471
25 - Furniture	$0	$1,437	$1,060	$63	$2,560
26 - Paper	$1,352	$1,266	$3,055	$180	$5,853
27 - Printing	$620	$5,363	$2,345	$138	$8,466
28 - Chemicals	$0	$1,765	$4,532	$267	$6,565
29 - Petroleum	$2,078	$233	$4,974	$293	$7,578
30 - Plastics	$0	$2,769	$2,043	$120	$4,933
31 - Leather	$0	$205	$336	$20	$561
32 - Stone/clay/glass	$2,225	$2,078	$5,194	$306	$9,803
33 - Primary metals	$2,116	$1,159	$10,465	$617	$14,357
34 - Fabricated metals	$0	$5,519	$3,664	$216	$9,399
35 - Machinery	$0	$6,191	$3,400	$201	$9,792
36 - Electrical equip.	$8,296	$2,511	$19,223	$1,134	$31,163
37 - Transportation equip.	$0	$1,539	$1,664	$98	$3,301
38 - Measure./photo.	$0	$1,512	$940	$55	$2,508
39 - Miscellaneous	$794	$1,531	$1,592	$94	$4,012
4911 - Electric services (coal and oil facilities only)	$0	$132	$1,707	$101	$1,941
4931 - Electric & other services (coal and oil facilities only)	$25	$101	$1,319	$78	$1,523
4939 - Combination utilities (coal and oil facilities only)	$2	$8	$144	$8	$163
4953 - Refuse systems	$0	$38	$513	$30	$581
5169 - Chemical wholesalers	$0	$658	$0	$0	$658
5171 -Bulk petroleum	$1,864	$902	$11,770	$694	$15,230
7389 - Solvent recovery services	$30	$45	$518	$31	$623
TOTAL	**$26,369**	**$47,393**	**$103,533**	**$6,105**	**$183,401**

TABLE 4-7b
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 1 — SUBSEQUENT YEARS
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping/ Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$0	$16	$416	$36	$467
12 - Coal mining	$0	$103	$1,028	$89	$1,219
20 - Food	$0	$758	$4,377	$378	$5,514
21 - Tobacco	$0	$6	$216	$19	$240
22 - Textiles	$0	$234	$1,905	$165	$2,304
23 - Apparel	$0	$692	$714	$62	$1,467
24 - Lumber	$0	$800	$7,094	$613	$8,507
25 - Furniture	$0	$359	$724	$63	$1,145
26 - Paper	$0	$316	$2,085	$180	$2,582
27 - Printing	$0	$1,341	$1,601	$138	$3,080
28 - Chemicals	$0	$441	$3,094	$267	$3,802
29 - Petroleum	$0	$58	$3,395	$293	$3,747
30 - Plastics	$0	$692	$1,395	$120	$2,207
31 - Leather	$0	$51	$229	$20	$300
32 - Stone/clay/glass	$0	$519	$3,546	$306	$4,371
33 - Primary metals	$0	$290	$7,143	$617	$8,050
34 - Fabricated metals	$0	$1,380	$2,501	$216	$4,097
35 - Machinery	$0	$1,548	$2,321	$201	$4,069
36 - Electrical equip.	$0	$628	$13,121	$1,134	$14,883
37 - Transportation equip.	$0	$385	$1,136	$98	$1,619
38 - Measure./photo.	$0	$378	$642	$55	$1,075
39 - Miscellaneous	$0	$383	$1,087	$94	$1,564
4911 - Electric services (coal and oil facilities only)	$0	$33	$1,165	$101	$1,299
4931 - Electric & other services (coal and oil facilities only)	$0	$25	$900	$78	$1,003
4939 - Combination utilities (coal and oil facilities only)	$0	$2	$98	$8	$109
4953 - Refuse systems	$0	$10	$350	$30	$390
5169 - Chemical wholesalers	$0	$164	$0	$0	$164
5171 -Bulk petroleum	$0	$226	$8,034	$694	$8,954
7389 - Solvent recovery services	$0	$11	$354	$31	$395
TOTAL	**$0**	**$11,848**	**$70,671**	**$6,105**	**$88,625**

TABLE 4-8a
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 2 — FIRST YEAR
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$82	$43	$609	$36	$770
12 - Coal mining	$0	$278	$1,506	$89	$1,873
20 - Food	$1,780	$2,054	$5,324	$314	$9,471
21 - Tobacco	$60	$15	$230	$14	$319
22 - Textiles	$184	$632	$1,832	$108	$2,757
23 - Apparel	$172	$1,873	$436	$26	$2,507
24 - Lumber	$12	$2,165	$4,125	$243	$6,546
25 - Furniture	$0	$973	$609	$36	$1,618
26 - Paper	$801	$857	$1,995	$118	$3,771
27 - Printing	$0	$3,630	$1,017	$60	$4,707
28 - Chemicals	$0	$1,195	$3,127	$184	$4,506
29 - Petroleum	$0	$158	$719	$42	$920
30 - Plastics	$0	$1,874	$1,117	$66	$3,058
31 - Leather	$0	$139	$206	$12	$357
32 - Stone/clay/glass	$821	$1,406	$2,489	$147	$4,864
33 - Primary metals	$2,116	$785	$10,465	$617	$13,982
34 - Fabricated metals	$0	$3,736	$2,125	$125	$5,986
35 - Machinery	$0	$4,191	$1,444	$85	$5,719
36 - Electrical equip.	$8,271	$1,700	$19,175	$1,131	$30,276
37 - Transportation equip.	$0	$1,042	$1,664	$98	$2,804
38 - Measure./photo.	$0	$1,024	$360	$21	$1,404
39 - Miscellaneous	$406	$1,037	$844	$50	$2,336
4911 - Electric services (coal and oil facilities only)	$0	$90	$1,607	$95	$1,791
4931 - Electric & other services (coal and oil facilities only)	$0	$68	$1,266	$75	$1,409
4939 - Combination utilities (coal and oil facilities only)	$0	$5	$139	$8	$153
4953 - Refuse systems	$0	$26	$513	$30	$569
5169 - Chemical wholesalers	$0	$445	$0	$0	$445
5171 -Bulk petroleum	$0	$611	$4,676	$276	$5,563
7389 - Solvent recovery services	$0	$30	$460	$27	$518
TOTAL	**$14,705**	**$32,080**	**$70,080**	**$4,133**	**$120,998**

TABLE 4-8b
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 2 — SUBSEQUENT YEARS
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$0	$11	$416	$36	$462
12 - Coal mining	$0	$70	$1,028	$89	$1,186
20 - Food	$0	$513	$3,634	$314	$4,461
21 - Tobacco	$0	$4	$157	$14	$175
22 - Textiles	$0	$158	$1,251	$108	$1,517
23 - Apparel	$0	$468	$298	$26	$792
24 - Lumber	$0	$541	$2,815	$243	$3,600
25 - Furniture	$0	$243	$416	$36	$695
26 - Paper	$0	$214	$1,362	$118	$1,694
27 - Printing	$0	$908	$694	$60	$1,662
28 - Chemicals	$0	$299	$2,135	$184	$2,618
29 - Petroleum	$0	$39	$491	$42	$573
30 - Plastics	$0	$469	$763	$66	$1,297
31 - Leather	$0	$35	$141	$12	$188
32 - Stone/clay/glass	$0	$352	$1,699	$147	$2,197
33 - Primary metals	$0	$196	$7,143	$617	$7,957
34 - Fabricated metals	$0	$934	$1,450	$125	$2,509
35 - Machinery	$0	$1,048	$985	$85	$2,118
36 - Electrical equip.	$0	$425	$13,089	$1,131	$14,644
37 - Transportation equip.	$0	$260	$1,136	$98	$1,495
38 - Measure./photo.	$0	$256	$246	$21	$523
39 - Miscellaneous	$0	$259	$576	$50	$885
4911 - Electric services (coal and oil facilities only)	$0	$22	$1,097	$95	$1,214
4931 - Electric & other services (coal and oil facilities only)	$0	$17	$864	$75	$956
4939 - Combination utilities (coal and oil facilities only)	$0	$1	$95	$8	$104
4953 - Refuse systems	$0	$6	$350	$30	$387
5169 - Chemical wholesalers	$0	$111	$0	$0	$111
5171 -Bulk petroleum	$0	$153	$3,192	$276	$3,620
7389 - Solvent recovery services	$0	$8	$314	$27	$349
TOTAL	**$0**	**$8,020**	**$47,837**	**$4,133**	**$59,989**

TABLE 4-9a
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 3 — SELECTED OPTION — FIRST YEAR
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$82	$29	$609	$36	$756
12 - Coal mining	$0	$187	$1,506	$89	$1,782
20 - Food	$0	$1,379	$1,396	$82	$2,857
21 - Tobacco	$12	$10	$139	$8	$170
22 - Textiles	$0	$425	$882	$52	$1,359
23 - Apparel	$0	$1,258	$77	$5	$1,339
24 - Lumber	$0	$1,454	$513	$30	$1,998
25 - Furniture	$0	$653	$288	$17	$958
26 - Paper	$291	$575	$1,012	$60	$1,938
27 - Printing	$0	$2,438	$197	$12	$2,646
28 - Chemicals	$0	$802	$2,384	$141	$3,327
29 - Petroleum	$0	$106	$456	$27	$589
30 - Plastics	$0	$1,259	$403	$24	$1,685
31 - Leather	$0	$93	$86	$5	$185
32 - Stone/clay/glass	$0	$944	$892	$53	$1,889
33 - Primary metals	$1,526	$527	$9,328	$550	$11,931
34 - Fabricated metals	$0	$2,509	$1,281	$76	$3,865
35 - Machinery	$0	$2,814	$254	$15	$3,083
36 - Electrical equip.	$7,034	$1,141	$16,791	$990	$25,957
37 - Transportation equip.	$0	$700	$1,664	$98	$2,462
38 - Measure./photo.	$0	$687	$34	$2	$723
39 - Miscellaneous	$112	$696	$278	$16	$1,103
4911 - Electric services (coal and oil facilities only)	$0	$60	$1,444	$85	$1,589
4931 - Electric & other services (coal and oil facilities only)	$0	$46	$1,180	$70	$1,295
4939 - Combination utilities (coal and oil facilities only)	$0	$4	$129	$8	$141
4953 - Refuse systems	$0	$17	$513	$30	$561
5169 - Chemical wholesalers	$0	$299	$0	$0	$299
5171 -Bulk petroleum	$0	$410	$2,954	$174	$3,539
7389 - Solvent recovery services	$0	$20	$374	$22	$417
TOTAL	**$9,058**	**$21,544**	**$47,064**	**$2,775**	**$80,441**

TABLE 4-9b
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 3 — SELECTED OPTION — SUBSEQUENT YEARS
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$0	$7	$416	$36	$459
12 - Coal mining	$0	$47	$1,028	$89	$1,163
20 - Food	$0	$345	$953	$82	$1,380
21 - Tobacco	$0	$3	$95	$8	$106
22 - Textiles	$0	$106	$602	$52	$761
23 - Apparel	$0	$314	$52	$5	$371
24 - Lumber	$0	$364	$350	$30	$744
25 - Furniture	$0	$163	$196	$17	$377
26 - Paper	$0	$144	$691	$60	$894
27 - Printing	$0	$609	$134	$12	$755
28 - Chemicals	$0	$201	$1,627	$141	$1,968
29 - Petroleum	$0	$27	$311	$27	$364
30 - Plastics	$0	$315	$275	$24	$613
31 - Leather	$0	$23	$59	$5	$87
32 - Stone/clay/glass	$0	$236	$609	$53	$898
33 - Primary metals	$0	$132	$6,368	$550	$7,049
34 - Fabricated metals	$0	$627	$874	$76	$1,577
35 - Machinery	$0	$704	$174	$15	$892
36 - Electrical equip.	$0	$285	$11,462	$990	$12,737
37 - Transportation equip.	$0	$175	$1,136	$98	$1,409
38 - Measure./photo.	$0	$172	$23	$2	$197
39 - Miscellaneous	$0	$174	$190	$16	$380
4911 - Electric services (coal and oil facilities only)	$0	$15	$985	$85	$1,086
4931 - Electric & other services (coal and oil facilities only)	$0	$11	$805	$70	$886
4939 - Combination utilities (coal and oil facilities only)	$0	$1	$88	$8	$97
4953 - Refuse systems	$0	$4	$350	$30	$385
5169 - Chemical wholesalers	$0	$75	$0	$0	$75
5171 -Bulk petroleum	$0	$103	$2,017	$174	$2,293
7389 - Solvent recovery services	$0	$5	$255	$22	$283
TOTAL	**$0**	**$5,386**	**$32,126**	**$2,775**	**$40,287**

TABLE 4-10a
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 4 — FIRST YEAR
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping/ Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$82	$14	$609	$36	$742
12 - Coal mining	$0	$94	$1,506	$89	$1,689
20 - Food	$0	$697	$576	$34	$1,307
21 - Tobacco	$0	$5	$67	$4	$76
22 - Textiles	$0	$215	$379	$22	$616
23 - Apparel	$0	$636	$19	$1	$656
24 - Lumber	$0	$735	$82	$5	$821
25 - Furniture	$0	$330	$134	$8	$472
26 - Paper	$0	$291	$451	$27	$768
27 - Printing	$0	$1,232	$53	$3	$1,288
28 - Chemicals	$0	$406	$1,727	$102	$2,234
29 - Petroleum	$0	$54	$451	$27	$531
30 - Plastics	$0	$636	$158	$9	$804
31 - Leather	$0	$47	$34	$2	$83
32 - Stone/clay/glass	$0	$477	$849	$50	$1,376
33 - Primary metals	$0	$266	$5,007	$295	$5,569
34 - Fabricated metals	$0	$1,268	$926	$55	$2,248
35 - Machinery	$0	$1,422	$67	$4	$1,494
36 - Electrical equip.	$2,011	$577	$7,113	$419	$10,120
37 - Transportation equip.	$0	$354	$67	$4	$425
38 - Measure./photo.	$0	$347	$0	$0	$347
39 - Miscellaneous	$42	$352	$144	$8	$547
4911 - Electric services (coal and oil facilities only)	$0	$30	$1,237	$73	$1,341
4931 - Electric & other services (coal and oil facilities only)	$0	$23	$1,074	$63	$1,161
4939 - Combination utilities (coal and oil facilities only)	$0	$2	$115	$7	$124
4953 - Refuse systems	$0	$9	$513	$30	$552
5169 - Chemical wholesalers	$0	$151	$0	$0	$151
5171 -Bulk petroleum	$0	$207	$240	$14	$461
7389 - Solvent recovery services	$0	$10	$192	$11	$213
TOTAL	**$2,136**	**$10,889**	**$23,788**	**$1,403**	**$38,216**

TABLE 4-10b
DISTRIBUTION OF ESTIMATED COSTS BY COMPLIANCE ACTIVITY
OPTION 4 — SUBSEQUENT YEARS
(1998 Dollars)

SIC Code	Rule Familiarization ($ thousands)	Compliance Determination ($ thousands)	Form R Completion ($ thousands)	Recordkeeping / Mailing ($ thousands)	Total ($ thousands)
10 - Metal mining	$0	$4	$416	$36	$455
12 - Coal mining	$0	$24	$1,028	$89	$1,140
20 - Food	$0	$174	$393	$34	$601
21 - Tobacco	$0	$1	$46	$4	$51
22 - Textiles	$0	$54	$259	$22	$335
23 - Apparel	$0	$159	$13	$1	$173
24 - Lumber	$0	$184	$56	$5	$244
25 - Furniture	$0	$83	$92	$8	$182
26 - Paper	$0	$73	$308	$27	$407
27 - Printing	$0	$308	$36	$3	$347
28 - Chemicals	$0	$101	$1,179	$102	$1,382
29 - Petroleum	$0	$13	$308	$27	$348
30 - Plastics	$0	$159	$108	$9	$276
31 - Leather	$0	$12	$23	$2	$37
32 - Stone/clay/glass	$0	$119	$579	$50	$749
33 - Primary metals	$0	$67	$3,418	$295	$3,780
34 - Fabricated metals	$0	$317	$632	$55	$1,003
35 - Machinery	$0	$356	$46	$4	$405
36 - Electrical equip.	$0	$144	$4,855	$419	$5,419
37 - Transportation equip.	$0	$88	$46	$4	$138
38 - Measure./photo.	$0	$87	$0	$0	$87
39 - Miscellaneous	$0	$88	$98	$8	$195
4911 - Electric services (coal and oil facilities only)	$0	$8	$845	$73	$925
4931 - Electric & other services (coal and oil facilities only)	$0	$6	$733	$63	$802
4939 - Combination utilities (coal and oil facilities only)	$0	$0	$79	$7	$86
4953 - Refuse systems	$0	$2	$350	$30	$383
5169 - Chemical wholesalers	$0	$38	$0	$0	$38
5171 -Bulk petroleum	$0	$52	$164	$14	$230
7389 - Solvent recovery services	$0	$3	$131	$11	$145
TOTAL	**$0**	**$2,722**	**$16,238**	**$1,403**	**$20,363**

4.1.4 COSTS FOR PUBLICLY-OWNED FACILITIES

Municipal electric utilities are the only publicly-owned facilities expected to be affected by the final lead rule. Table 4-11 presents the estimated number of affected municipal electric utilities and the estimated number of reports from these facilities. Table 4-12 presents the cost to these facilities for the first year and for subsequent years. These facilities, reports, and costs are included in the electric services (SIC codes 4911, 4931, and 4939) estimates in the other summary tables in this chapter.

TABLE 4-11
REPORTING ESTIMATES FOR PUBLICLY-OWNED FACILITIES
ALL OPTIONS

Option	Facilities Affected/Total Reports
Option 1	10
Option 2	9
Option 3 (Selected)	8
Option 4	6

TABLE 4-12
ESTIMATED COSTS FOR PUBLICLY-OWNED FACILITIES
ALL OPTIONS
(Thousands of 1998 dollars)

Option	First Year	Subsequent Years
Option 1	$54	$36
Option 2	$48	$33
Option 3 (Selected)	$42	$29
Option 4	$31	$22

4.1.5 TRANSFER PAYMENTS AND NON-MONETIZED COSTS

There are various state and federal requirements that are linked to the EPCRA section 313 reporting requirements. The associated requirements include state taxes and fees, state pollution prevention planning requirements, and special requirements for certain National Pollutant Discharge Elimination System (NPDES) storm water permits. These requirements are discussed in Appendix L (Associated Requirements) of the Economic Analysis of the Final Rule to Modify Reporting of PBT Chemicals Under EPCRA Section 313 (U.S. EPA, 1999). The costs calculated in this chapter include only those activities that are required by this rule. Although the fees, taxes, and pollution prevention requirements are linked to EPCRA section 313 reporting, they are not required by this rulemaking.

4.2 EPA COSTS

This section examines costs EPA would incur due to the final lead rule. By lowering the reporting thresholds for lead and lead compounds, EPA will incur costs for data processing, outreach and training, information dissemination, policy and petitions, and compliance and enforcement. These activities require additional EPA personnel, as well as extramural funds (for example, for contractors to perform data processing).

One way to characterize EPA's resource requirements is in terms of the number of data elements that must be processed. A data element is a single unit of information reported on Form R, such as the facility address or the number of pounds of the chemical released to air, that is entered into the TRI Information Management System. There are an average of 103 data elements entered into the system for each Form R. EPA is estimated to require 2.61 employees (also known as full time equivalents, or FTEs) and $551,600 in extramural funds for each additional million data elements that are added.[5] Assuming that half of the EPA employees are at the general pay scale grade 12 (i.e., GS-12, at a salary of $47,066) and half are at grade 13 (i.e., GS-13, at a salary of $55,969), and using a loading factor of 1.6 to account for employee benefits and other cost factors, yields an estimated annual cost of $82,428 per EPA employee.

Based on the number of reports predicted for the selected option, and assuming that these reports will also contain an average of 103 data elements each, this yields an estimate of 1.0 million data elements. This translates into an estimate of $775,000 per year for EPA costs in subsequent years. These results are summarized in Table 4-13. The additional first-year costs to be incurred by EPA for outreach, training, and guidance are roughly estimated at $400,000. These costs are expected to be incurred in the first year only and are in addition to the costs presented in Table 4-13.

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[5]See Appendix K of the *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313 Reporting (*April, 1997) for details of EPA's employee and cost model for TRI.

TABLE 4-13
SUMMARY OF INCREMENTAL EPA COSTS
SELECTED OPTION
(Thousands of 1998 dollars)

DESCRIPTION	REPORTING REQUIREMENTS
# Data Elements	1.0 million
FTEs	2.6
Cost of FTEs	$217
Extramural Cost	$558
Total EPA Costs	**$775,000**

4.3 TOTAL COSTS

The estimated total cost to industry and EPA of the final lead rule is $81 million in the first year and $41 million in subsequent years. Table 4-14 summarizes the total costs to industry and EPA of the final lead rule.

TABLE 4-14
SUMMARY OF TOTAL COSTS
OF THE FINAL LEAD RULE
(Millions of 1998 dollars)

DESCRIPTION	First Year	Subsequent Years
Industry Costs	$80	$40
EPA Costs	$1.2	$0.8
TOTAL COSTS	**$81**	**$41**

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CHAPTER 5
ESTIMATED IMPACTS OF THE RULE

This chapter addresses the potential impacts of the final rule on small entities, as well as on certain demographic groups. Section 5.1 provides a description of the potential impacts on small entities under the selected option. Section 5.2 considers whether the final rule adversely affects minorities and/or disadvantaged populations or children.

5.1 IMPACTS ON SMALL ENTITIES

The Regulatory Flexibility Act (RFA) of 1980 (5 U.S.C. § 601 *et. seq.*) requires federal agencies to assess the effects of regulations on small entities and, in some instances, to examine alternatives to the regulations that may reduce adverse economic effects on significantly impacted small entities. The RFA requires agencies to prepare an initial and final regulatory flexibility analysis for each rule unless the Agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.

Since 1980, the RFA has required Federal agencies to assess the economic impacts of their actions on small entities, including businesses, nonprofit agencies, and governments. Section 604 of the RFA, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, requires EPA to perform a final regulatory flexibility analysis for the final rule unless the Agency certifies under section 605(b) that the regulatory action will not have a significant economic impact on a substantial number of small entities. The RFA does not specifically define "a significant economic impact on a substantial number" of small entities.

Section 5.1.1 provides the definition of a small entity for each industry group covered under the final rule. Section 5.1.2 describes the general methodology used to determine if the final rule will result in significant economic impacts on a substantial number of small entities. Section 5.1.3 describes the estimation of the number of small companies affected. Section 5.1.4 describes the revenue data used in this analysis. Section 5.1.5 discusses the specific approach used to analyze the impacts on each industry group and presents the results for each of these analyses. Section 5.1.6 summarizes the results for all affected small entities.

5.1.1 DEFINITIONS OF SMALL ENTITIES

The RFA utilizes the definition of "small business" found in the Small Business Act, which authorizes the Small Business Administration (SBA) to further define "small business" by regulation. For this analysis, EPA is using the Small Business Administration's (SBA's) definition of a small business for each industry.[1]

SBA's small business size standards vary by industry. In establishing size standards, SBA considers a number of economic and market characteristics that may allow a business concern to exercise dominance in an industry. Size standards are based on criteria, such as annual receipts or number of employees, that represent a measure of these characteristics. These standards represent the largest size that a for-profit enterprise (together with its affiliates) may be and qualify as a small business. Table 5-1 provides SBA small business definitions for the industries included in this analysis.

TABLE 5-1
SBA SMALL BUSINESS SIZE STANDARDS BY INDUSTRY

SIC Code	Size Standard
Metal mining (SIC code 10)	500 employees
Coal mining (SIC code 12)	500 employees
Dog and cat food (SIC code 2047)	500 employees
Prepared feeds and feed ingredients for animals and fowls, except dogs and cats (SIC code 2048)	500 employees
Pulp mills (SIC code 2611)	750 employees
Inorganic pigments (SIC code 2816)	1,000 employees
Industrial inorganic chemicals, n.e.c. (SIC code 2819)	1,000 employees
Plastics materials, synthetic resins, and nonvulcanizable elastomers (SIC code 2821)	750 employees
Nitrogenous fertilizers (SIC code 2873)	1,000 employees
Phosphatic fertilizers (SIC code 2874)	500 employees
Fertilizers, mixing only (SIC code 2875)	500 employees
Petroleum refining (SIC code 2911)	1,500 employees
Asphalt paving mixtures and blocks (SIC code 2951)	500 employees
Pressed and blown glass and glassware, n.e.c. (SIC code 3229)	750 employees
Glass products, made of purchased glass (SIC code 3231)	500 employees
Cement, hydraulic (SIC code 3241)	750 employees
Vitreous china plumbing fixtures and china and earthenware fittings and bathroom accessories (SIC code 3261)	750 employees
Steel works, blast furnaces (including coke ovens), and rolling mills (SIC code 3312)	1,000 employees
Electrometallurgical products, except steel (SIC code 3313)	750 employees
Steel wiredrawing and steel nails and spikes (SIC code 3315)	1,000 employees

[1] SBA's most recent revisions to its “size standards” can be found in the January 31, 1996 Federal Register (61 FR 3175). Several minor corrections were published subsequent to the January notice. The SBA Internet site contains the corrected standards. The Internet address is: http://www.sba.gov/regulations/siccodes/

TABLE 5-1, CONT'D.
SBA SMALL BUSINESS SIZE STANDARDS BY INDUSTRY

SIC Code	Size Standard
Gray and ductile iron foundries (SIC code 3321)	500 employees
Malleable iron foundries (SIC code 3322)	500 employees
Steel investment foundries (SIC code 3324)	500 employees
Steel foundries, n.e.c. (SIC code 3325)	500 employees
Primary smelting and refining of copper (SIC code 3331)	1,000 employees
Primary production of aluminum (SIC code 3334)	1,000 employees
Primary smelting and refining of nonferrous metals, except copper and aluminum (SIC code 3339)	750 employees
Secondary smelting and refining of nonferrous metals (SIC code 3341)	500 employees
Rolling, drawing, and extruding of copper (SIC code 3351)	750 employees
Aluminum sheet, plate, and foil (SIC code 3353)	750 employees
Aluminum extruded products (SIC code 3354)	750 employees
Aluminum rolling and drawing, n.e.c. (SIC code 3355)	750 employees
Aluminum die-castings (SIC code 3363)	500 employees
Aluminum foundries (SIC code 3365)	500 employees
Electroplating, plating, polishing, anodizing, and coloring (SIC code 3471)	500 employees
Coating, engraving, and allied services, n.e.c. (SIC code 3479)	500 employees
Small arms ammunition (SIC code 3482)	1,000 employees
Electron tubes (SIC code 3671)	750 employees
Printed circuit boards (SIC code 3672)	500 employees
Semiconductors and related devices (SIC code 3674)	500 employees
Electronic capacitors (SIC code 3675)	500 employees
Electronic resistors (SIC code 3676)	500 employees
Electronic coils, transformers, and other inductors (SIC code 3677)	500 employees
Electronic connectors (SIC code 3678)	500 employees
Electronic components, N.E.C. (SIC code 3679)	500 employees
Storage batteries (SIC code 3691)	500 employees
Motor vehicles and passenger car bodies (SIC code 3711)	1,000 employees
Truck and bus bodies (SIC code 3713)	500 employees
Motor vehicle parts and accessories (SIC code 3714)	750 employees
Truck trailers (SIC code 3715	500 employees
Motor homes (SIC code 3716)	1,000 employees
Musical instruments (SIC code 3931)	500 employees
Manufacturers (SIC codes 20-39)	500 employees
Electric services (SIC code 4911)	4 million megawatt hours
Electric and other services (SIC code 4931)	$5.0 million in annual receipts
Combination utilities (SIC code 4939)	$5.0 million in annual receipts
Refuse systems (SIC code 4953)	$6.0 million in annual receipts
Chemical and allied products (SIC code 5169)	100 employees
Petroleum bulk stations & terminals (SIC code 5171)	100 employees
Business services (SIC code 7389)	$5.0 million in annual receipts

The SBA small business size standards are expansive, classifying most businesses as "small." For example, the default SBA size standard for manufacturing industries is 500 employees. According to information compiled by the Bureau of the Census, 325,395 of 330,310 firms have fewer than 500 employees (SBA, 1995). Therefore, at least 98.5 percent of firms would be classified as small businesses according to the SBA definition. In fact, this percentage is actually higher, since for certain SIC codes within manufacturing, the SBA size standard is 750, 1,000, or 1,500 employees.

The RFA defines "small governmental jurisdictions" as governments of cities, counties, towns, school districts, or special districts with a population of less than 50,000 people. This analysis applies this definition of a small governmental jurisdiction in evaluating the impacts on publicly-owned establishments affected by this rulemaking (i.e., municipally-owned electric utilities).

The RFA defines "small organizations" as any "not-for-profit enterprise which is independently owned and operated and is not dominant in its field." No small organizations are expected to report on lead and lead compounds as a result of the final rule.

5.1.2 METHODOLOGY OVERVIEW

This analysis uses annual cost impact percentages to measure potential impacts on small entities. The cost impact percentage is defined as annual compliance costs as a percentage of annual revenues or sales. This approach is based on the premise that the cost impact percentage is an appropriate measure of a firm's ability to afford the costs attributable to a regulatory change. For purposes of determining small entity impacts, comparing annual compliance costs to annual revenues provides a reasonable indication of the magnitude of the regulatory burden relative to a commonly available and objective measure of a company's business volume. Where regulatory costs represent a very small fraction of a typical firm's revenue, the impacts of the regulation are likely to be minimal.

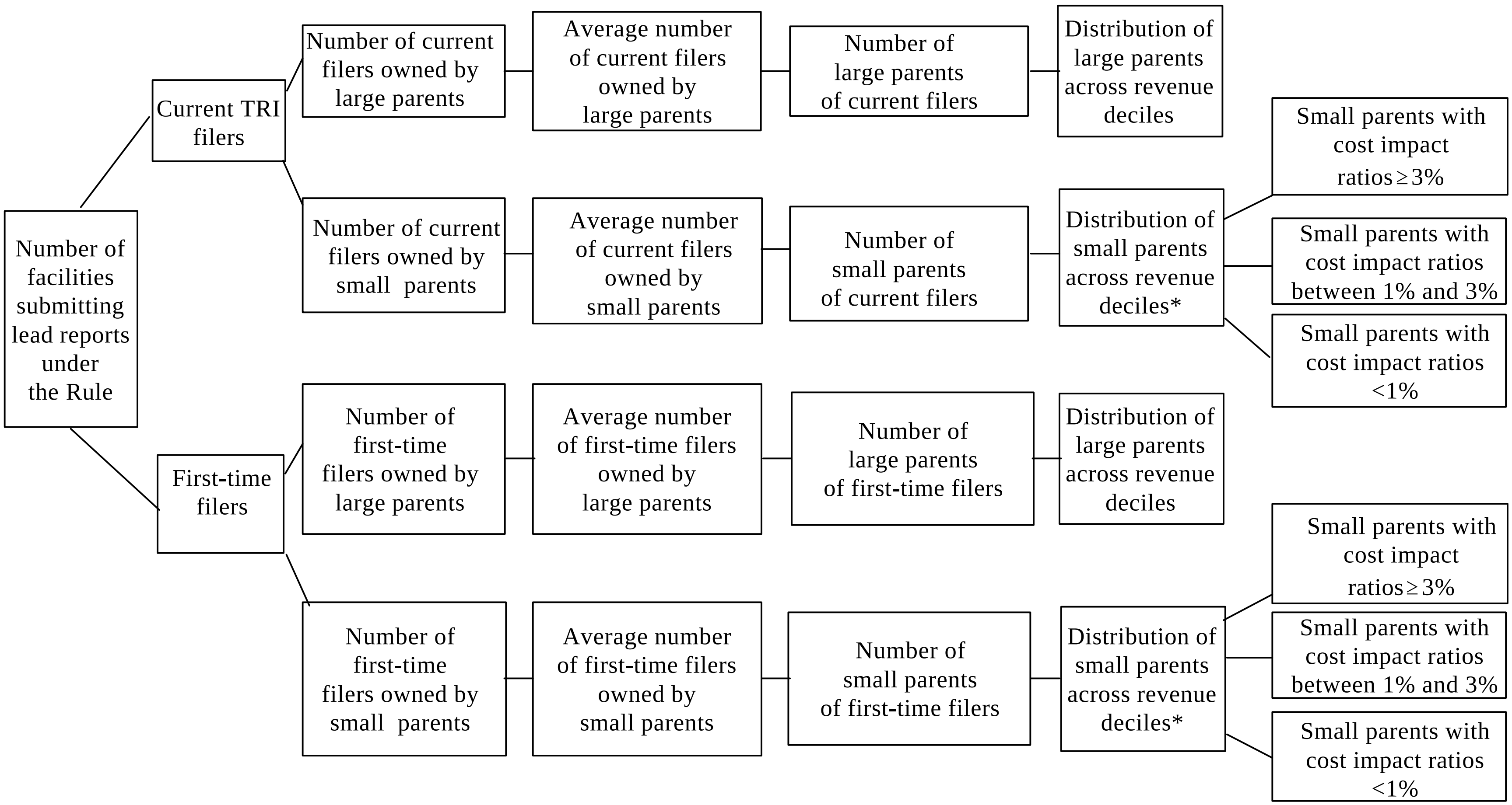
The cost impact percentages are calculated using both the first- and subsequent-year compliance costs. As explained in Chapter 4, annual compliance costs are composed of facility- and report-specific costs. Facility-specific costs such as compliance determination and rule familiarization do not vary with the number of reports filed. Report-specific costs such as Form R completion and recordkeeping vary according to the total number of TRI reports a facility files.

The general methodology followed to estimate the impacts on small entities consists of the following steps (see Figure 5-1):

(1) Estimate the number of facilities filing a report due to the final rule;

(2) Estimate the number of small companies affected (i.e., the number of small companies with at least one reporting facility);

FIGURE 5-1:
FLOWCHART OF THE SMALL ENTITY ANALYSIS



* For current reporters, parent companies are distributed evenly across revenue deciles developed using revenues for parents of facilities currently reporting to TRI. For new non-combustion reporters, affected parent companies are distributed evenly across revenue deciles developed using revenues for parents of facilities not currently reporting to TRI. For new combustion reporters, affected parent companies are distributed across revenue categories in the same percentages as small companies owning current TRI filers are found among small companies in D&B.

(3) Develop company-level annual compliance cost estimates, based on the number of facilities per company, the number of reports per facility, and whether the facilities are current or first-time TRI filers;

(4) Model annual revenues of affected small companies;

(5) Estimate the company-level impact percentages, defined as annual compliance costs as a percentage of annual revenues, as a measure of regulatory burden;

(6) Estimate the percentage and number of small companies with company-level annual impact percentages in each of three categories: (1) less than one percent of annual revenues; (2) between one and three percent of annual revenues; and (3) greater than or equal to three percent of annual revenues.

Because the specific identity of each affected company is not known, this analysis models the characteristics of potentially affected companies. These characteristics are modeled at different levels of aggregation, reflecting the limitations and availability of the underlying data. Specifically, SIC codes 10 and 12 are modeled at the 2-digit SIC code level. Within the manufacturing sector, affected SIC codes are examined at the 2-digit level. SIC code 5171 is modeled at the four-digit level. For coal- and oil-fired electric services (SIC codes 4911, 4931, and 4939), RCRA subtitle C facilities (SIC code 4953), and solvent recovery services (SIC code 7389), the analysis models only the specific portions of the industry groups subject to TRI reporting. The resolution of the impact results reported in Section 5.1.5 varies by industry group as a result of the modeling described above. In the following sections, the analysis and results for each industry group are described. In addition, there is a section describing the analysis of the impacts on publicly-owned entities.

5.1.3 ESTIMATING THE NUMBER OF SMALL COMPANIES AFFECTED AND COMPANY-LEVEL COMPLIANCE COSTS

The derivation of the number of facilities expected to file additional reports due to the final rule is presented in Appendix A. Affected facilities can be classified as 1) facilities that are already reporting on other TRI chemicals (i.e., current filers) or 2) facilities that will report to TRI for the first time (i.e., first-time filers). In the small entity analysis it is necessary to estimate the number of parent companies owning these affected facilities as the impacts of the final rule will be estimated at the parent company level.

To estimate the number of small companies affected, EPA used the following approach:

Step 1: Estimate the number of current filers and first-time filers who will file TRI reports as a result of the rule. The number of first-time filers is estimated by subtracting the estimate of current filers from the total number of filers expected under this rule. (See Chapter 3, Section 3.2 for a detailed discussion of the derivation of current and first-time filers.)

Step 2: Assign current and first-time filers to ownership by large or small parents. The proportion of facilities owned by large or small parents is based on the total number of facilities in each SIC code reported to be owned by large or small parent companies.[2]

Step 3: Estimate the number of large and small parent companies owned by current and first-time filers using the average number of facilities per parent. Dun and Bradstreet (D&B) data are used to derive the average number of facilities per small parent company and per large parent company.[2]

Table 5-2 presents the estimated number of small entities for the selected option of a 10-pound reporting threshold for lead and lead compounds.

Parent company compliance cost estimates were developed by multiplying the unit costs of compliance for current filers and for first-time filers by one report per facility and by the average number of facilities per parent company, as follows:

Total cost for parent companies of current filers (and for all filers in subsequent years)

$$= \left[(1\ \mathit{Report/Facility} \times \#\ \mathit{Facilities/Company}) \times (\mathit{Form\ R\ Completion\ Cost} + \mathit{Recordkeeping\ Cost})\right]$$
$$+ \left[(\#\ \mathit{Facilities/Company} \times (\mathit{Compliance\ Determination\ Cost} \times \mathit{Weighting\ Factor}))\right]$$

Total cost for parent companies of first-time filers

$$= \left[(1\ \mathit{Report/Facility} \times \#\ \mathit{Facilities/Company}) \times (\mathit{Form\ R\ Completion\ Cost} + \mathit{Recordkeeping\ Cost})\right]$$
$$+ \left(\#\ \mathit{Facilities/Company} \times \left[(\mathit{Compliance\ Determination\ Cost} \times \mathit{Weighting\ Factor}) + (\mathit{Rule\ Familiarization\ Cost})\right]\right)$$

These costs and weighting factors, which were developed for typical TRI reporting facilities, are described in detail in Chapter 4.

[2] For current filers, Dun and Bradstreet (D&B) data for 1998 TRI filers is used. For first-time filers, D&B data for non-TRI filers is used.

TABLE 5-2
ESTIMATED NUMBER OF AFFECTED SMALL ENTITIES
SELECTED OPTION

SIC Code	Estimated Number of Affected Facilities	Estimated Number of Current Filers	Estimated Number of First-Time Filers	Estimated Number of Small Parent Companies Associated With Current Filers	Estimated Number of Small Parent Companies Associated With First-time Filers
10 - Metal mining	127	94	33	20	13
12 - Coal mining	314	314	0	176	0
20 - Food	291	291	0	35	0
21 - Tobacco	29	24	5	8	2
22 - Textiles	184	184	0	58	0
23 - Apparel	16	16	0	12	0
24 - Lumber	107	107	0	33	0
25 - Furniture	60	60	0	15	0
26 - Paper	211	94	117	17	64
27 - Printing	41	41	0	11	0
28 - Chemicals	497	497	0	157	0
29 - Petroleum	95	95	0	24	0
30 - Plastics	84	84	0	33	0
31 - Leather	18	18	0	4	0
32 - Stone/clay/glass	186	186	0	43	0
33 - Primary metals	1,945	1,332	613	498	414
34 - Fabricated metals	267	267	0	120	0
35 - Machinery	53	53	0	12	0
36 - Electrical equip.	3,501	675	2,826	147	1,902
37 - Transportation equip.	347	347	0	78	0
38 - Measure./photo.	7	7	0	1	0
39 - Miscellaneous	58	13	45	5	39
4911 - Electric services (coal and oil facilities only)	293	293	0	22	0
4931 - Electric & other services (coal and oil facilities only)	246	246	0	15	0
4939 - Combination utilities (coal and oil facilities only)	27	27	0	8	0
4953 - Refuse systems	107	107	0	11	0
5171 -Bulk petroleum	616	616	0	60	0
7389 - Solvent recovery services	78	78	0	4	0
Municipal Utilities	8	8	0	7	0
Total	9,813	6,174	3,639	1,634	2,434

Note: Due to rounding, calculations may not yield exact numbers.

5.1.4 GENERATION OF COMPANY REVENUE DATA

This section describes how employment and revenue data were developed to characterize companies in affected industries. This analysis does not predict which specific companies have facilities that are expected to report on lead and lead compounds. Rather, the general approach is to construct SIC code profiles that represent potential reporting companies. These profiles are then used to estimate the employment and revenues of the parent companies of potentially affected facilities and to estimate the percentage of parent companies classified as large or small.

Facilities expected to report under the lead rule can be classified as 1) facilities that are already reporting on other TRI chemicals, including PBT chemicals (i.e., current filers) or 2) facilities that will report to TRI for the first time (i.e., first-time filers). For all SIC codes, employment and revenue profiles were constructed for each type of reporter as follows:

- **Current Filers.** Facilities that file an additional TRI report on lead or lead compounds as a result of the final rule are expected to be similar to current TRI filers from that SIC code. Employment and revenue profiles were constructed for parent companies of TRI filers from each SIC code to represent parent companies of current filers that file additional reports as a result of this rule.[3]

- **First-time Filers.** Facilities that file their first TRI report as a result of the final rule are expected to be similar to facilities that do not currently report to TRI, but which are otherwise subject to TRI reporting based on their SIC code and employment. Employment and revenue profiles for each SIC code were constructed for parent companies of facilities that do not currently report to TRI to represent parent companies of facilities that will report to TRI for the first time as a result of the final rule.

Company employment and revenue data were obtained for commercial facilities in the SIC codes affected by the final rule from *Dun and Bradstreet's Market Identifiers On-Line Data Base* and *Dun's Marketing Services*, both services of Dun and Bradstreet (D&B). For over 11 million business locations, D&B provides data such as:

- Number of employees,
- Line of business,
- Key financial indicators,
- Parent/headquarters,

as well as many other variables. Employment and revenue data for parent companies owning facilities in all of the affected SIC codes were obtained from an April 1999 version of *Dun's*

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[3] For SIC codes 12, 21, 23, 4931, 4939, and 7389 there were too few parent companies associated with current filers to construct meaningful revenue profiles at the level of disaggregation used in this analysis. For SIC codes 12, 21, 23, 4931, and 4939, employment and revenue data for all parent companies in the SIC code in Dun and Bradstreet were used to construct the revenue profiles. See Section 5.1.5 for a discussion of the revenues used to analyze SIC code 7389.

Marketing Services available through EPA’s Mainframe computer. These revenues are in 1998 dollars. EPA accessed *Dun's Marketing Services* through the FINDS system located on the Agency's IBM mainframe computer. The FINDS system contains selected D&B variables and no financial data other than revenue. The D&B database uses the Standard Industrial Classification (SIC) code system to categorize businesses based on the type of activity undertaken at that location. The employment and revenue data used in this analysis represent data for ultimate parent companies that own one or more facilities with a *primary* SIC code matching one of the SIC codes covered under the final rule.[4,5]

As mentioned above, it is assumed that the current filers affected by the lead rule are similar to all facilities reporting to TRI in 1998 in terms of employment and revenues. Therefore, current TRI filers were identified in D&B. Employment and revenue data were obtained for the ultimate parent companies linked to these facilities. For facilities that are first-time filers, it is assumed that they have revenues and employment similar to facilities that do not currently report to TRI.[6] Therefore, facilities not currently reporting to TRI were identified in D&B.

Employment and revenue data were obtained for the ultimate parent companies linked to these facilities. Using the employment and revenue data, parent companies in each SIC code were classified as small or large (based on SBA definitions). Information on the average number of facilities per parent company was derived for small and large companies within the SIC code. For current filers, the average number of facilities per parent is calculated using information on facilities currently filing to TRI. For first-time filers, the average number of facilities per parent is calculated using information on all facilities with 10 or more employees in D&B not currently filing to TRI.

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[4] A facility with multiple SIC codes is subject to TRI if the largest share of its revenue is from a covered SIC code, or if the total value of revenues derived from covered SIC codes represents a majority of the facility's revenues. It is not possible to determine whether a facility would be subject to reporting based on the Dun & Bradstreet SIC code listing alone. Dun's contains a primary SIC code and up to five additional (secondary) SIC codes; each SIC code represents a minimum of 10 percent of the location's revenue. For this analysis, it was assumed that the primary SIC code represents the largest share of a facility's operations, and thus a facility with a primary SIC code covered by the final rule was assumed to be subject to TRI reporting.

[5] The ultimate parent is the uppermost parent or headquarters that encompasses all directly related branches, subsidiaries, or parents of a specific business at a specific location. This analysis assumes that a facility, as defined under TRI, is equivalent to a location as defined by D&B. A “facility,” subject to EPCRA section 313 reporting requirements, means all buildings, equipment, structures, and other stationary items which are located on a single site or on contiguous or adjacent sites, and which are owned or operated by the same person, that is classified under an SIC code covered by the regulations, has 10 or more employees or the equivalent, and manufactures, processes, or otherwise uses any of the listed toxic chemicals or chemical categories above the specific reporting thresholds. For some industries this may not correspond exactly to the definition of a location by D&B.

[6] See earlier discussion in this chapter of the derivation of revenue profiles for first-time filers.

For SIC code 4911, the SBA definition of a small business is four million megawatt hours (MWh) of electricity output annually. The analysis of this industry is based on a database of steam-generating power plants available from the Utility Data Institute (UDI). To match the SBA size definition, which applies to the parent company and all subsidiaries, divisions, and branches, it was necessary to aggregate the coal- and oil-fired power plants listed in the UDI database based on common ownership. Determining common ownership of these power generating facilities was accomplished by matching facilities listed in the UDI database with information in *Dun & Bradstreet's Market Identifiers On-Line Database*, which provides a unique Dun's number for each location listed in the database and also indicates whether the location is a subsidiary, division, or branch, or has a separate headquarters and/or immediate and ultimate parent. Some facilities in the UDI database had no immediate or ultimate parent listed in the Dun & Bradstreet database. For these facilities, the owner listed in the UDI database was assumed to be the ultimate parent. By this method, all facilities sharing common ownership were aggregated under a single listing for the ultimate parent to the extent indicated by the data sources used.

The small entity analysis accounts for parent companies owning more than one affected facility. Consistent with the SBA size standards, the ultimate parent data obtained include available data on employees and revenues of <u>all</u> subsidiaries, divisions, and branches of that parent, including those not individually affected under the final rule. The estimated number of facilities per ultimate parent, however, represents the number of facilities owned by that parent company that are classified in the affected SIC code (not the total number of facilities per parent company).

Revenue deciles were constructed for each size class (i.e., large and small) and SIC code. Within each size class, companies are ranked from highest revenue to lowest revenue. Each decile contains 10 percent of the companies in each size class. For the purposes of this analysis, the revenues of companies within each decile are characterized by the revenues of the largest company in each decile.[7] Revenue data are broken into deciles in this analysis to provide a high level of resolution among revenue categories without running out of observations with which to make the intervals meaningful.

The information outlined in this section on company size, company revenues, and numbers of reporting facilities per company is used in the following sections to estimate small entity impacts. Table 5-3 presents company-level revenues by decile for small companies. See Appendix B for company-level revenues by decile for large companies.

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[7] The one exception is the 10th decile where median company revenues in the 10th decile are used to avoid the possibility of using an outlier to characterize revenues in the highest decile.

TABLE 5-3
SMALL COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES									
		1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	4,857,000	6,600,000	16,700,000	24,474,208	28,167,496	42,200,000	60,000,000	68,740,000	76,800,000	139,036,992
	New Filer	500,000	950,000	1,114,776	1,700,000	2,200,000	3,500,000	4,922,960	12,252,000	27,939,648	80,000,000
12	Current Filer	970,000	1,221,472	1,500,000	2,100,000	2,700,000	3,500,000	5,000,000	11,650,000	21,850,000	44,700,000
	New Filer	970,000	1,212,272	1,500,000	2,100,000	2,700,000	3,500,000	5,000,000	11,500,000	21,600,000	45,000,000
20	Current Filer	6,650,000	12,668,326	18,300,000	30,000,000	46,000,000	60,000,000	82,926,032	115,000,000	172,439,888	240,000,000
	New Filer	620,000	1,000,000	1,400,000	2,000,000	2,800,000	4,100,000	6,500,000	12,000,000	24,900,000	45,000,000
21	Current Filer	470,000	560,000	990,000	1,519,755	2,800,000	4,000,000	8,124,000	11,900,000	19,700,000	92,000,000
	New Filer	470,000	560,000	990,000	1,300,000	2,598,380	4,000,000	8,100,000	11,500,000	17,700,000	53,787,000
22	Current Filer	5,000,000	7,200,000	10,400,000	17,800,000	25,900,000	31,276,880	41,155,616	50,000,000	72,800,000	85,000,000
	New Filer	680,000	960,000	1,200,000	1,600,000	2,300,000	3,200,000	5,000,000	8,237,899	16,722,000	28,973,000
23	Current Filer	500,000	750,000	1,000,000	1,200,000	1,500,000	2,090,243	3,091,000	5,308,110	11,479,000	20,285,000
	New Filer	500,000	750,000	1,000,000	1,200,000	1,500,000	2,079,694	3,082,180	5,300,000	11,324,418	20,223,744
24	Current Filer	1,900,000	4,000,000	6,643,469	9,600,000	14,026,063	19,074,400	29,152,992	45,000,000	70,000,000	100,000,000
	New Filer	560,000	750,000	990,000	1,200,000	1,500,000	2,000,000	3,000,000	4,800,000	9,500,000	17,300,000
25	Current Filer	6,362,585	8,427,282	10,700,000	15,850,741	17,829,952	20,000,000	24,031,616	33,800,000	45,000,000	60,000,000
	New Filer	610,000	820,000	1,000,000	1,356,121	1,800,000	2,500,000	3,548,000	5,800,000	11,000,000	19,361,000
26	Current Filer	3,600,000	9,300,000	18,500,000	25,900,000	32,258,096	44,900,000	49,400,000	57,820,560	100,000,000	160,000,000
	New Filer	1,000,000	1,500,000	2,000,000	2,880,000	4,000,000	5,500,000	8,000,000	12,800,000	24,162,624	38,412,848
27	Current Filer	4,900,000	5,700,000	8,200,000	12,100,000	16,806,080	24,600,000	30,360,192	35,000,000	53,137,600	58,000,000
	New Filer	500,000	700,000	890,000	1,100,000	1,400,000	1,900,000	2,600,000	4,000,000	8,001,963	14,600,000
28	Current Filer	2,388,926	3,800,000	5,500,000	8,000,000	10,900,000	16,000,000	24,000,000	36,100,000	63,000,000	107,000,000
	New Filer	990,000	1,300,000	1,800,000	2,400,000	3,200,000	4,673,000	7,000,000	12,800,000	27,700,000	51,400,000
29	Current Filer	2,300,744	4,652,601	6,800,000	11,002,515	18,294,656	25,900,000	50,000,000	85,000,000	175,000,000	250,000,000
	New Filer	1,400,000	2,000,000	2,800,000	3,831,000	5,000,000	6,700,000	9,947,000	16,600,000	39,000,000	80,000,000

TABLE 5-3, CONT'D.
SMALL COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES 1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
30	Current Filer	1,019,174	1,900,000	3,000,000	4,678,585	7,230,439	10,735,910	16,300,000	26,000,000	46,300,000	61,000,000
	New Filer	800,000	1,028,848	1,500,000	2,000,000	2,898,870	4,000,000	5,400,000	8,500,000	16,600,000	29,368,000
31	Current Filer	828,700	8,000,000	8,200,000	10,000,000	16,004,624	20,000,000	30,000,000	38,000,000	41,906,000	90,500,000
	New Filer	500,000	700,000	930,000	1,200,000	1,700,000	2,424,000	3,800,000	5,500,000	12,000,000	20,200,000
32	Current Filer	1,915,948	4,699,920	7,300,000	11,033,562	15,367,271	20,000,000	26,600,000	40,500,000	75,100,000	99,494,752
	New Filer	675,316	980,000	1,200,000	1,600,000	2,052,283	3,000,000	4,000,000	6,300,000	12,000,000	21,000,000
33	Current Filer	2,000,000	4,000,000	6,087,589	10,000,000	15,400,000	22,500,000	31,600,000	50,000,000	100,000,000	150,000,000
	New Filer	810,000	1,046,697	1,500,000	2,100,000	3,000,000	4,156,067	6,000,000	10,100,000	24,137,216	48,000,000
34	Current Filer	1,600,000	2,600,000	4,000,000	6,000,000	9,126,498	12,558,441	20,000,000	27,500,000	44,543,392	68,000,000
	New Filer	710,000	1,000,000	1,200,000	1,600,000	2,066,873	3,000,000	4,100,000	6,300,000	12,000,000	21,079,000
35	Current Filer	4,100,000	7,123,528	10,496,858	16,000,000	20,000,000	23,300,000	28,300,000	42,000,000	56,030,432	80,000,000
	New Filer	675,101	940,000	1,168,159	1,500,000	2,000,000	2,651,354	3,900,000	5,935,465	11,396,488	21,152,000
36	Current Filer	4,000,000	5,147,693	7,040,099	9,700,000	14,219,208	19,300,000	24,000,000	32,619,008	49,800,000	77,110,000
	New Filer	801,942	1,100,000	1,500,000	2,000,000	2,700,000	3,800,000	5,400,000	9,100,000	18,538,344	34,904,500
37	Current Filer	2,646,965	5,337,306	8,992,254	12,608,047	22,100,000	30,000,000	40,000,000	55,401,648	95,350,992	131,000,000
	New Filer	800,000	1,000,000	1,474,897	2,000,000	2,764,798	4,000,000	5,900,000	10,000,000	21,600,000	36,967,248
38	Current Filer	1,500,000	3,300,000	7,500,000	10,008,664	12,839,502	19,882,496	33,361,072	41,314,496	54,182,928	100,000,000
	New Filer	800,000	1,000,000	1,380,213	1,800,000	2,358,764	3,299,942	5,000,000	7,659,000	15,000,000	27,000,000
39	Current Filer	1,475,860	3,714,222	5,900,000	7,759,437	10,273,488	12,000,000	19,550,000	25,000,000	40,000,000	61,030,000
	New Filer	570,000	750,000	990,000	1,200,000	1,500,000	2,000,000	3,000,000	4,900,000	9,700,000	17,000,000
4911	Current Filer	3,500,000	23,800,000	49,408,800	91,200,288	119,236,048	188,268,000	313,661,952	686,190,848	1,656,000,000	1,828,599,808
	New Filer	2,271,515	12,343,741	38,126,624	79,564,616	123,209,616	172,321,512	219,104,000	372,645,376	896,626,944	1,656,000,000
4931	Current Filer	2,097,114	2,300,000	2,500,000	2,700,000	3,150,000	3,593,498	4,400,000	314,212,864	1,656,000,000	1,828,599,808
	New Filer	2,097,114	2,300,000	2,500,000	2,700,000	3,100,000	3,300,000	4,400,000	314,212,864	1,656,000,000	1,828,599,808
4939	Current Filer	1,200,000	1,350,000	1,700,000	1,850,000	2,300,000	2,750,000	3,100,000	4,750,000	896,626,944	1,828,599,808
	New Filer	1,200,000	1,350,000	1,700,000	1,850,000	2,300,000	2,750,000	3,100,000	4,750,000	896,626,944	1,828,599,808

TABLE 5-3, CONT'D.
SMALL COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES 1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4953	Current Filer	580,000	1,700,000	1,800,000	3,012,749	3,515,000	10,000,000	11,928,849	14,550,848	76,700,000	76,700,000
	New Filer	740,000	880,000	1,000,000	1,300,000	1,600,000	2,000,000	2,600,000	3,400,000	4,700,000	5,500,000
5171	Current Filer	4,500,000	6,728,026	9,353,621	11,943,674	17,435,232	22,000,000	29,000,000	44,438,992	72,703,584	469,999,872
	New Filer	2,995,132	3,655,758	4,682,849	6,000,000	7,912,796	10,401,924	14,007,728	19,937,328	30,000,000	44,686,512

Note: No first-time filers are estimated in the following SIC Codes: 12, 25, 27, 28, 29, 30, 31, 34, 35, 37, 38, 4911, 4931, 4939, 4953, 5171.

5.1.5 ESTIMATING IMPACTS

To evaluate the potential impact of the final rule, annual compliance costs are estimated at the company level to be consistent with the financial data generated from D&B and other sources. For purposes of evaluating the impacts on small entities, an "affected" facility is defined as a facility that will submit at least one report as a result of the final rule. Thus, an "affected" company under this analysis is defined as a company owning at least one "affected" facility.

The analysis of small entity impacts for all SIC codes uses (1) an estimate of the typical cost of reporting,[8] (2) the average number of facilities per company for small companies in each SIC code, and (3) the annual revenue for the 1st through the 10th revenue deciles for small companies in each SIC code. For SIC codes 10, 12, 20-39, 4931, 4939, and 5171, the revenue data and average number of locations per small company were estimated from Dun and Bradstreet data, as described in Section 5.1.4. For SIC codes 4953 and 7389, only a subset of facilities in each SIC code are expected to report to TRI. Specifically, SIC code 4953, refuse systems, is limited to RCRA Subtitle C facilities, and SIC code 7389 is limited to solvent recovery services.[9,10] No first-time filers are expected from SIC code 4953. Thus, only facilities already filing to TRI are expected to be affected by the lead rule in SIC 4953. Following the methodology in Section 5.1.4, revenue and average number of facilities per parent company were obtained from D&B only for those facilities filing to TRI in 1998. For SIC code 7389, however, there are not enough revenue data available for affected small companies to construct revenue deciles. Further, it is not appropriate to construct revenue deciles for the SIC code as a whole, since only a subset of this SIC code is subject to TRI reporting. Thus, since only four small companies will be affected by the lead rule, and the identities of the four companies are known, the cost impact to *each* of these companies was analyzed.

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[8] Since this final rule deals with a single parent metal and its compounds, each facility could file, at most, one additional report.

[9] The TRI Industry Expansion analysis identified 162 facilities in SIC code 4953 expected to report.

[10] The number of potentially affected solvent recovery facilities in SIC code 7389 was derived from two sources. The first was a letter from Safety-Kleen to EPA (letter from Gary S. King, Safety-Kleen, to Maria Doa, EPA, "RE: Safety-Kleen Classifications," dated December 15, 1997), that identified Safety-Kleen facilities in 139 cities. Based on the available information, all 139 of these facilities belong in SIC code 7389, and thus are subject to TRI reporting. The second source of information was Safety-Kleen's public comment on the proposed TRI industry expansion rule. ["Comments on the Proposed Rule Addressing Addition of Facilities in Certain Industry Sectors to the Toxic Release Reporting Rule (61 FR 33587); Docket No. OPPTS-400104D," September 26, 1996, Comment No. D2-403, Table 1]. Safety-Kleen identified seven additional Safety-Kleen facilities and 44 facilities owned by other companies engaged in commercial solvent recovery. Again, EPA believes that all of these facilities may belong in SIC code 7389, and thus are subject to TRI reporting. Therefore, the total number of potentially affected facilities in SIC code 7389 is the sum of the 146 Safety-Kleen facilities (139+7) and the 44 other commercial solvent recovery facilities, or 190 facilities.

Table 5-4 presents the estimated first-year and subsequent-year company-level cost impact percentages for the 1st through 10th deciles for small companies in all affected SIC codes under the selected option (Option 3). See Appendix B for the estimated first-year and subsequent-year company-level cost impact percentages for the 1st through 10th deciles for large companies in all affected SIC codes under the selected option (Option 3).

Estimating Small Company Impacts

The number of small companies predicted to experience impacts of 1) less than one percent of annual revenues, 2) between one percent and three percent of annual revenues, or 3) greater than or equal to three percent of annual revenues is estimated assuming a distribution of affected companies by revenue level. Different distributions were assumed for small companies owning each of the following types of filers:

- Current TRI filers that are expected to report as a result of the lead rule *and* first-time filers reporting for activities other than combustion,
- First-time filers reporting due to combustion activities.

Companies owning current TRI filers expected to report as a result of the lead rule and companies owning facilities reporting for the first time due to activities other than combustion were assumed to be evenly distributed across the 1st through 10th decile (in 10 percent increments) of annual revenues for each industry group.[11] An estimated 3,966 small companies are distributed in this way under Option 3. Assuming an even distribution of companies across deciles level implies that one-tenth of the affected companies are like those in the 1st decile, one-tenth are like those in the 2nd decile, and one-tenth are like those in the 3rd decile, and so on. Assuming an even distribution may overestimate the percentage (and number) of companies with lower revenues, and thus, with higher cost impacts if reporting is more likely among companies with higher material throughputs and revenues in each SIC code.

In this analysis it is assumed that, similar to companies owning facilities currently reporting to TRI, facilities filing for the first time due to combustion are likely to be owned by companies with revenues in the higher revenue deciles. As shown in Appendix A, facilities reporting for the first time due to combustion have high throughputs of fuel. It is expected that fuel throughput and revenues are positively correlated. Therefore, facilities using the affected fuels in large amounts can be expected to fall into the higher revenue deciles. These companies were distributed across revenue deciles in the same percentages as small companies owning current TRI filers are found among all small companies in D&B. An estimated 101 small companies are distributed in this way under Option 3. Using this distribution, approximately 85 percent of small companies owning facilities reporting for the first time due to combustion activities are assigned revenues in the 7th - 10th revenue deciles with 50 percent of companies having revenues in the 10th revenue decile alone. Another 18 percent of these companies are

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[11] The development of these deciles was described in Section 5.1.4.

TABLE 5-4a
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	1.50	$7,778	0.16%	0.12%	0.05%	0.03%	0.03%	0.02%	0.01%	0.01%	0.01%	0.01%
	New Filer	1.24	$9,549	1.91%	1.01%	0.86%	0.56%	0.43%	0.27%	0.19%	0.08%	0.03%	0.01%
12	Current Filer	1.12	$5,829	0.60%	0.48%	0.42%	0.28%	0.22%	0.17%	0.12%	0.05%	0.03%	0.01%
	New Filer	1.12	$8,616	0.89%	0.71%	0.57%	0.41%	0.32%	0.25%	0.17%	0.07%	0.04%	0.02%
20	Current Filer	1.25	$6,482	0.10%	0.05%	0.04%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.13	$8,657	1.40%	0.87%	0.62%	0.43%	0.31%	0.21%	0.13%	0.07%	0.03%	0.02%
21	Current Filer	1.09	$5,666	1.21%	1.01%	0.57%	0.37%	0.20%	0.14%	0.07%	0.05%	0.03%	0.01%
	New Filer	1.08	$8,254	1.76%	1.47%	0.83%	0.63%	0.32%	0.21%	0.10%	0.07%	0.05%	0.02%
22	Current Filer	1.08	$5,595	0.11%	0.08%	0.05%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%
	New Filer	1.10	$8,456	1.24%	0.88%	0.70%	0.53%	0.37%	0.26%	0.17%	0.10%	0.05%	0.03%
23	Current Filer	1.09	$5,650	1.13%	0.75%	0.56%	0.47%	0.38%	0.27%	0.18%	0.11%	0.05%	0.03%
	New Filer	1.09	$8,361	1.67%	1.11%	0.84%	0.70%	0.56%	0.40%	0.27%	0.16%	0.07%	0.04%
24	Current Filer	1.23	$6,363	0.33%	0.16%	0.10%	0.07%	0.05%	0.03%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.07	$8,212	1.47%	1.09%	0.83%	0.68%	0.55%	0.41%	0.27%	0.17%	0.09%	0.05%
25	Current Filer	1.08	$5,618	0.09%	0.07%	0.05%	0.04%	0.03%	0.03%	0.02%	0.02%	0.01%	0.01%
	New Filer	1.07	$8,236	1.35%	1.00%	0.82%	0.61%	0.46%	0.33%	0.23%	0.14%	0.07%	0.04%
26	Current Filer	1.08	$5,580	0.15%	0.06%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.15	$8,794	0.88%	0.59%	0.44%	0.31%	0.22%	0.16%	0.11%	0.07%	0.04%	0.02%
27	Current Filer	1.02	$5,306	0.11%	0.09%	0.06%	0.04%	0.03%	0.02%	0.02%	0.02%	0.01%	0.01%
	New Filer	1.09	$8,357	1.67%	1.19%	0.94%	0.76%	0.60%	0.44%	0.32%	0.21%	0.10%	0.06%
28	Current Filer	1.26	$6,555	0.27%	0.17%	0.12%	0.08%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%
	New Filer	1.15	$8,800	0.89%	0.68%	0.49%	0.37%	0.28%	0.19%	0.13%	0.07%	0.03%	0.02%
29	Current Filer	1.44	$7,465	0.32%	0.16%	0.11%	0.07%	0.04%	0.03%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.18	$9,045	0.65%	0.45%	0.32%	0.24%	0.18%	0.13%	0.09%	0.05%	0.02%	0.01%
30	Current Filer	1.15	$5,983	0.59%	0.31%	0.20%	0.13%	0.08%	0.06%	0.04%	0.02%	0.01%	0.01%
	New Filer	1.12	$8,609	1.08%	0.84%	0.57%	0.43%	0.30%	0.22%	0.16%	0.10%	0.05%	0.03%

TABLE 5-4a, CONT'D.
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
31	Current Filer	1.08	$5,585	0.67%	0.07%	0.07%	0.06%	0.03%	0.03%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.09	$8,339	1.67%	1.19%	0.90%	0.69%	0.49%	0.34%	0.22%	0.15%	0.07%	0.04%
32	Current Filer	1.14	$5,932	0.31%	0.13%	0.08%	0.05%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.21	$9,305	1.38%	0.95%	0.78%	0.58%	0.45%	0.31%	0.23%	0.15%	0.08%	0.04%
33	Current Filer	1.17	$6,066	0.30%	0.15%	0.10%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%
	New Filer	1.10	$8,434	1.04%	0.81%	0.56%	0.40%	0.28%	0.20%	0.14%	0.08%	0.03%	0.02%
34	Current Filer	1.12	$5,814	0.36%	0.22%	0.15%	0.10%	0.06%	0.05%	0.03%	0.02%	0.01%	0.01%
	New Filer	1.09	$8,338	1.17%	0.83%	0.69%	0.52%	0.40%	0.28%	0.20%	0.13%	0.07%	0.04%
35	Current Filer	1.07	$5,572	0.14%	0.08%	0.05%	0.03%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.06	$8,170	1.21%	0.87%	0.70%	0.54%	0.41%	0.31%	0.21%	0.14%	0.07%	0.04%
36	Current Filer	1.10	$5,693	0.14%	0.11%	0.08%	0.06%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%
	New Filer	1.10	$8,420	1.05%	0.77%	0.56%	0.42%	0.31%	0.22%	0.16%	0.09%	0.05%	0.02%
37	Current Filer	1.09	$5,649	0.21%	0.11%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.08	$8,310	1.04%	0.83%	0.56%	0.42%	0.30%	0.21%	0.14%	0.08%	0.04%	0.02%
38	Current Filer	1.07	$5,531	0.37%	0.17%	0.07%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.08	$8,271	1.03%	0.83%	0.60%	0.46%	0.35%	0.25%	0.17%	0.11%	0.06%	0.03%
39	Current Filer	1.09	$5,634	0.38%	0.15%	0.10%	0.07%	0.05%	0.05%	0.03%	0.02%	0.01%	0.01%
	New Filer	1.05	$8,026	1.41%	1.07%	0.81%	0.67%	0.54%	0.40%	0.27%	0.16%	0.08%	0.05%
4911	Current Filer	1.93	$10,001	0.29%	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.04	$31,040	1.37%	0.25%	0.08%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
4931	Current Filer	3.32	$17,207	0.82%	0.75%	0.69%	0.64%	0.55%	0.48%	0.39%	0.01%	0.00%	0.00%
	New Filer	3.19	$24,486	1.17%	1.06%	0.98%	0.91%	0.79%	0.74%	0.56%	0.01%	0.00%	0.00%
4939	Current Filer	1.09	$5,630	0.47%	0.42%	0.33%	0.30%	0.24%	0.20%	0.18%	0.12%	0.00%	0.00%
	New Filer	1.09	$8,333	0.69%	0.62%	0.49%	0.45%	0.36%	0.30%	0.27%	0.18%	0.00%	0.00%

TABLE 5-4a, CONT'D.
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4953	Current Filer	1.33	$6,914	1.19%	0.41%	0.38%	0.23%	0.20%	0.07%	0.06%	0.05%	0.01%	0.01%
	New Filer	1.04	$7,987	0.24%	0.24%	0.24%	0.24%	0.24%	0.23%	0.22%	0.19%	0.17%	0.13%
5171	Current Filer	1.12	$5,814	0.13%	0.09%	0.06%	0.05%	0.03%	0.03%	0.02%	0.01%	0.01%	0.00%
	New Filer	1.07	$8,242	0.28%	0.23%	0.18%	0.14%	0.10%	0.08%	0.06%	0.04%	0.03%	0.02%

Note: No first-time filers are estimated in the following SIC Codes: 12, 25, 27, 28, 29, 30, 31, 34, 35, 37, 38, 4911, 4931, 4939, 4953, 5171.

TABLE 5-4b
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	1.50	$5,375	0.11%	0.08%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.24	$4,459	0.89%	0.47%	0.40%	0.26%	0.20%	0.13%	0.09%	0.04%	0.02%	0.01%
12	Current Filer	1.12	$4,028	0.42%	0.33%	0.29%	0.19%	0.15%	0.12%	0.08%	0.03%	0.02%	0.01%
	New Filer	1.12	$4,023	0.41%	0.33%	0.27%	0.19%	0.15%	0.11%	0.08%	0.03%	0.02%	0.01%
20	Current Filer	1.25	$4,479	0.07%	0.04%	0.02%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
	New Filer	1.13	$4,042	0.65%	0.40%	0.29%	0.20%	0.14%	0.10%	0.06%	0.03%	0.02%	0.01%
21	Current Filer	1.09	$3,915	0.83%	0.70%	0.40%	0.26%	0.14%	0.10%	0.05%	0.03%	0.02%	0.00%
	New Filer	1.08	$3,854	0.82%	0.69%	0.39%	0.30%	0.15%	0.10%	0.05%	0.03%	0.02%	0.01%
22	Current Filer	1.08	$3,866	0.08%	0.05%	0.04%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.10	$3,948	0.58%	0.41%	0.33%	0.25%	0.17%	0.12%	0.08%	0.05%	0.02%	0.01%
23	Current Filer	1.09	$3,904	0.78%	0.52%	0.39%	0.33%	0.26%	0.19%	0.13%	0.07%	0.03%	0.02%
	New Filer	1.09	$3,904	0.78%	0.52%	0.39%	0.33%	0.26%	0.19%	0.13%	0.07%	0.03%	0.02%
24	Current Filer	1.23	$4,397	0.23%	0.11%	0.07%	0.05%	0.03%	0.02%	0.02%	0.01%	0.01%	0.00%
	New Filer	1.07	$3,834	0.68%	0.51%	0.39%	0.32%	0.26%	0.19%	0.13%	0.08%	0.04%	0.02%
25	Current Filer	1.08	$3,882	0.06%	0.05%	0.04%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.07	$3,846	0.63%	0.47%	0.38%	0.28%	0.21%	0.15%	0.11%	0.07%	0.03%	0.02%
26	Current Filer	1.08	$3,855	0.11%	0.04%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.15	$4,106	0.41%	0.27%	0.21%	0.14%	0.10%	0.07%	0.05%	0.03%	0.02%	0.01%
27	Current Filer	1.02	$3,667	0.07%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%
	New Filer	1.09	$3,902	0.78%	0.56%	0.44%	0.35%	0.28%	0.21%	0.15%	0.10%	0.05%	0.03%
28	Current Filer	1.26	$4,530	0.19%	0.12%	0.08%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%
	New Filer	1.15	$4,109	0.42%	0.32%	0.23%	0.17%	0.13%	0.09%	0.06%	0.03%	0.01%	0.01%
29	Current Filer	1.44	$5,158	0.22%	0.11%	0.08%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.18	$4,223	0.30%	0.21%	0.15%	0.11%	0.08%	0.06%	0.04%	0.03%	0.01%	0.01%
30	Current Filer	1.15	$4,135	0.41%	0.22%	0.14%	0.09%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%
	New Filer	1.12	$4,019	0.50%	0.39%	0.27%	0.20%	0.14%	0.10%	0.07%	0.05%	0.02%	0.01%

TABLE 5-4b, CONT'D.
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
31	Current Filer	1.08	$3,859	0.47%	0.05%	0.05%	0.04%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.09	$3,894	0.78%	0.56%	0.42%	0.32%	0.23%	0.16%	0.10%	0.07%	0.03%	0.02%
32	Current Filer	1.14	$4,099	0.21%	0.09%	0.06%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%	0.00%
	New Filer	1.21	$4,344	0.64%	0.44%	0.36%	0.27%	0.21%	0.14%	0.11%	0.07%	0.04%	0.02%
33	Current Filer	1.17	$4,191	0.21%	0.10%	0.07%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.10	$3,938	0.49%	0.38%	0.26%	0.19%	0.13%	0.09%	0.07%	0.04%	0.02%	0.01%
34	Current Filer	1.12	$4,018	0.25%	0.15%	0.10%	0.07%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.09	$3,893	0.55%	0.39%	0.32%	0.24%	0.19%	0.13%	0.09%	0.06%	0.03%	0.02%
35	Current Filer	1.07	$3,850	0.09%	0.05%	0.04%	0.02%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.06	$3,814	0.57%	0.41%	0.33%	0.25%	0.19%	0.14%	0.10%	0.06%	0.03%	0.02%
36	Current Filer	1.10	$3,934	0.10%	0.08%	0.06%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%
	New Filer	1.10	$3,931	0.49%	0.36%	0.26%	0.20%	0.15%	0.10%	0.07%	0.04%	0.02%	0.01%
37	Current Filer	1.09	$3,904	0.15%	0.07%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%
	New Filer	1.08	$3,880	0.48%	0.39%	0.26%	0.19%	0.14%	0.10%	0.07%	0.04%	0.02%	0.01%
38	Current Filer	1.07	$3,822	0.25%	0.12%	0.05%	0.04%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.08	$3,862	0.48%	0.39%	0.28%	0.21%	0.16%	0.12%	0.08%	0.05%	0.03%	0.01%
39	Current Filer	1.09	$3,893	0.26%	0.10%	0.07%	0.05%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%
	New Filer	1.05	$3,747	0.66%	0.50%	0.38%	0.31%	0.25%	0.19%	0.12%	0.08%	0.04%	0.02%
4911	Current Filer	1.93	$6,911	0.20%	0.03%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.04	$14,493	0.64%	0.12%	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
4931	Current Filer	3.32	$11,890	0.57%	0.52%	0.48%	0.44%	0.38%	0.33%	0.27%	0.00%	0.00%	0.00%
	New Filer	3.19	$11,433	0.55%	0.50%	0.46%	0.42%	0.37%	0.35%	0.26%	0.00%	0.00%	0.00%
4939	Current Filer	1.09	$3,890	0.32%	0.29%	0.23%	0.21%	0.17%	0.14%	0.13%	0.08%	0.00%	0.00%
	New Filer	1.09	$3,890	0.32%	0.29%	0.23%	0.21%	0.17%	0.14%	0.13%	0.08%	0.00%	0.00%

TABLE 5-4b, CONT'D.
SMALL COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4953	Current Filer	1.33	$4,778	0.82%	0.28%	0.27%	0.16%	0.14%	0.05%	0.04%	0.03%	0.01%	0.01%
	New Filer	1.04	$3,729	0.11%	0.11%	0.11%	0.11%	0.11%	0.11%	0.10%	0.09%	0.08%	0.06%
5171	Current Filer	1.12	$4,018	0.09%	0.06%	0.04%	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%
	New Filer	1.07	$3,848	0.13%	0.11%	0.08%	0.06%	0.05%	0.04%	0.03%	0.02%	0.01%	0.01%

Note: No first-time filers are estimated in the following SIC Codes: 12,25, 27, 28, 29, 30, 31, 34, 35, 37, 38, 4911, 4931, 4939, 4953, 5171.

expected to have revenues in the 9^{th} revenue decile, 11 percent are expected to have revenues in the 8^{th} revenue decile and six percent will have revenues in the 7^{th} revenue decile.

The magnitude of the impact of the final lead rule on a small company depends on (1) the number of facilities that a small company has and (2) the overall revenues of the small company. The methodology used to estimate the impact of the final lead rule on small companies is straightforward due to the fact that each affected facility files only one report for lead and lead compounds. First, a per facility compliance cost is calculated for current filers and for first-time filers. This compliance cost consists of both facility-specific and report-specific costs. Second, an industry-specific parent company cost is calculated by multiplying the per facility cost by the average number of facilities per parent company in that industry group. Third, the parent company compliance cost is compared to each decile of annual revenues for each industry group.

As mentioned above, because there is not enough revenue data to construct deciles in SIC code 7389, and because the identity of the four small ultimate parents in SIC code 7389 is known, impacts were estimated for each of the four small ultimate parents separately. To estimate total cost per company, the number of facilities per small company was multiplied by the current filer reporting cost. Total costs are then compared to annual revenues for each of the four small companies.

Table 5-5 presents the estimated number of small companies in each impact category.

Estimating Impacts to Publicly-owned Facilities

This analysis examines the potential impacts on small municipalities that own one or more coal- and/or oil-fired electric generation facilities. Electric generation facilities are the only publicly-owned facilities expected to be affected by the rule. The universe of affected small municipalities under the rule is assumed to be a subset of the facilities in SIC code 4911 currently filing to TRI.

For the final rule, a total of 564 facilities from SIC code 4911 were identified as currently reporting from the 1998 TRI data (USEPA, 1999). Of the 564 facilities, 13 are publicly owned. It is assumed that the 13 facilities identified from the 1998 TRI data represent the universe of potentially affected municipal facilities.

TABLE 5-5a
SUMMARY OF IMPACTS ON SMALL ENTITIES
FIRST YEAR
SELECTED OPTION

SIC Code	Estimated Number of Affected Entities	Estimated Number of Affected Small Entities	Estimated Number of Small Entities with Impacts of 3 Percent or Greater	Estimated Number of Small Entities with Impacts Between 1 and 3 Percent	Estimated Number of Small Entities with Impacts Less than 1 Percent
10	67	33	0	3	30
12	202	176	0	0	176
20	86	35	0	0	35
21	14	10	0	2	8
22	125	58	0	0	58
23	13	12	0	1	11
24	49	33	0	0	33
25	31	15	0	0	15
26	113	81	0	0	81
27	24	11	0	0	11
28	228	157	0	0	157
29	45	24	0	0	24
30	51	33	0	0	33
31	10	4	0	0	4
32	85	43	0	0	43
33	1,251	912	0	40	872
34	174	120	0	0	120
35	28	12	0	0	12
36	2,437	2,049	0	189	1,860
37	157	78	0	0	78
38	4	1	0	0	1
39	51	44	0	3	41
4911	87	22	0	0	22
4931	90	15	0	0	15
4939	19	8	0	0	8
4953	56	11	0	1	10
5171	165	60	0	0	60
7389	29	4	0	0	4
Municipal Utilities	8	7	0	0	7
Total	5,699	4,068	0	239	3,829
Percentage of Small Entities			0.0%	5.9%	94.1%

Note: Due to rounding, calculations may not yield exact numbers.

TABLE 5-5b
SUMMARY OF IMPACTS ON SMALL ENTITIES
SUBSEQUENT YEARS
SELECTED OPTION

SIC Code	Estimated Number of Affected Entities	Estimated Number of Affected Small Entities	Estimated Number of Small Entities with Impacts of 3 Percent or Greater	Estimated Number of Small Entities with Impacts Between 1 and 3 Percent	Estimated Number of Small Entities with Impacts Less than 1 Percent
10	67	33	0	0	33
12	202	176	0	0	176
20	86	35	0	0	35
21	14	10	0	0	10
22	125	58	0	0	58
23	13	12	0	0	12
24	49	33	0	0	33
25	31	15	0	0	15
26	113	81	0	0	81
27	24	11	0	0	11
28	228	157	0	0	157
29	45	24	0	0	24
30	51	33	0	0	33
31	10	4	0	0	4
32	85	43	0	0	43
33	1,251	912	0	0	912
34	174	120	0	0	120
35	28	12	0	0	12
36	2,437	2,049	0	0	2,049
37	157	78	0	0	78
38	4	1	0	0	1
39	51	44	0	0	44
4,911	87	22	0	0	22
4,931	90	15	0	0	15
4,939	19	8	0	0	8
4,953	56	11	0	0	11
5,171	165	60	0	0	60
7,389	29	4	0	0	4
Municipal Utilities	8	7	0	0	7
Total	5,699	4,068	0	0	4,068
Percentage of Small Entities			0.0%	0.0%	100.0%

Note: Due to rounding, calculations may not yield exact numbers.

Because fuel throughput data are not available in the 1998 TRI reports, the number of potentially affected municipal facilities expected to report under the lead rule was estimated using information from a database of steam-generating power plants in 1994 developed by the Utility Data Institute (UDI). The UDI database provides ownership, employment, revenue, generation capacity and fuel throughput information for 49 municipal facilities in SIC 4911.[12] For each facility in the UDI database, the total pounds of lead manufactured due to combustion was calculated using fuel throughput information and the lead concentration data presented in Appendix A. The total pounds of lead manufactured by each facility was used to estimate the percentage of facilities in the UDI database exceeding each reporting threshold. The percentage of facilities in the UDI database exceeding each reporting threshold was applied to the universe of 13 facilities identified from the 1998 TRI data to estimate the number of municipal facilities expected to report under the lead rule under each option. Using this methodology, eight municipal facilities are expected to submit a report under the selected option.

Ultimate parent revenue data from Dun and Bradstreet was only available for one of the universe of 13 potentially affected municipal facilities. Due to this lack of data, the 13 facilities were matched to the 49 municipal facilities listed in the UDI database for which revenue data were obtained in the Industry Expansion Economic Analysis. Revenue data for an additional seven facilities was obtained from this match. These data were updated from 1995 dollars to 1998 dollars using the consumer price index.[13] The RFA defines a small government jurisdiction as having a population of less than 50,000 people. Population data for each of the 13 municipalities were obtained from a U.S. Census Bureau website (http://factfinder.census.gov/).[14] Based on these population data, 11 of the 13 facilities (85%) were found to be owned by small municipalities. Applying this percentage of small parent companies to the eight municipal facilities expected to submit a report under the selected option results in seven small affected municipalities.

The estimation of impacts on small municipalities follows the same methodology used for all other SIC codes with one difference. Because there were only six small parent companies with revenue data, deciles were constructed by assigning each revenue value to a decile in descending

[12] It is not clear why 1998 TRI reports were received from only 13 municipal facilities when EPA had predicted reporting from all 49 in the economic analysis of the industry expansion rule. One possible explanation is that electric utility deregulation has resulted in sales of public utilities to private companies. Another possibility is that municipal utilities have much lower throughputs of TRI chemicals than previously estimated.

[13] Utility revenues were examined, in place of annual governmental revenues, because revenue data were not available for several municipalities. Using utility revenue to examine the potential regulatory burden on these entities is expected to provide a more conservative estimate of the potential impacts on these small entities because the utility revenues represent only a portion of the total annual revenues for a municipality. Thus, it can be assumed that the cost impact percentage based on total annual municipal revenues will be lower than estimated when comparing utility compliance costs to utility revenues alone.

[14] This website contains information from the following sources: 1990 Decennial Census Summary Files, American Community Survey Summary Tables, Census 2000 Dress Rehearsal Summary Files, and the 1997 Economic Census Summary Files.

order. In other words, the highest revenue value was assigned to the 10th decile. The second highest revenue value was assigned to the 9th decile and so on. As a result, the 5th through the 1st revenue deciles all have the same value.

5.1.6 SUMMARY OF SMALL ENTITY IMPACTS

This section summarizes the estimated impacts for all small entities based on the results of the industry-specific analyses discussed in previous sections. Table 5-2 presents the estimated number of affected small companies within each industry group and the estimated number of affected small municipalities. Table 5-5 presents the estimated number of small companies and small municipalities falling into each impact category as well as the overall results for all companies and municipalities affected by the final lead rule. As Table 5-5 illustrates, the final lead rule is predicted to affect 4,068 small companies and municipalities. Of these small entities, 94% are predicted to have impacts of less than one percent of annual revenues in the first year. Six percent of the small entities are predicted to experience impacts between one and three percent of annual revenues in the first year. None of the small entities are predicted to experience impacts of greater than three percent of annual revenues in the first year. In subsequent years, all small entities are predicted to experience impacts below one percent of annual revenues.

5.2 IMPACTS ON CERTAIN DEMOGRAPHIC GROUPS

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that all federal agencies address the issue of environmental justice by identifying and revising programs, policies, and activities that may disproportionately and adversely affect the health of minority or low-income populations or their environments. Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks," requires that for rules that are economically significant under Executive Order 12866, federal agencies must, to the extent permitted by law and consistent with the agency's mission, identify and assess the environmental health risks and safety risks that may disproportionately affect children.

By lowering the section 313 reporting thresholds for lead and lead compounds, EPA is providing communities across the United States (including low-income populations and minority populations) with access to data that may assist them in lowering exposures and consequently reducing chemical risks for themselves and their children. This information can also be used by government agencies and others to identify potential problems, set priorities, and take appropriate steps to reduce any potential risks to human health and the environment. Specific activities, such as information dissemination, exposure mitigation, pollution prevention, outreach and educational programs, and consumer protection programs, can be expected to benefit minority and economically disadvantaged groups even if the programs are not specifically targeting these groups. The collection of this data will also assist in determining and responding to environmental health and safety risks to children. Therefore, the informational benefits of the final lead rule will have a positive effect on the human health and environment of minority populations, low-income populations, and children.

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CHAPTER 6
BENEFITS

6.1 INTRODUCTION

In enacting the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and the Pollution Prevention Act (PPA) of 1990, Congress recognized the significant benefits of providing information on the presence, releases, and waste management of toxic chemicals. The Toxic Release Inventory (TRI) has proven to be one of the most powerful forces in empowering the federal government, state and local governments, industry, environmental groups and the general public to fully participate in an informed dialogue about the environmental impacts of toxic chemicals in the United States. TRI's publicly available database provides quantitative information on toxic chemical releases and other waste management activities. With the collection of this information starting in 1987 came the ability for the public, government, and the regulated community to understand the magnitude of chemical releases in the United States, and to assess the need to reduce the releases and transfers of toxic chemicals. TRI enables all interested parties to establish credible baselines, to set realistic goals for environmental progress, and to measure progress in meeting these goals over time. As such, the TRI system has become a neutral yardstick by which progress can be measured by all stakeholders.

In this chapter, the benefits of expanding TRI reporting on lead and lead compounds under EPCRA Section 313 are discussed. Section 6.2 discusses the potential benefits of TRI reporting. Section 6.3 discusses the additional information on lead and lead compounds that may be collected under the final rule.

6.2 POTENTIAL BENEFITS OF TRI REPORTING

The information reported to TRI increases knowledge of the levels of toxic chemicals released to the environment and the potential pathways of exposure, improving scientific understanding of the health and environmental risks of toxic chemicals; allows the public to make informed decisions on where to work and live; enhances the ability of corporate leaders and purchasers to more accurately gauge a facility's potential environmental liabilities; provides reporting facilities with information that can be used to save money as well as to reduce emissions; and assists federal, state, and local authorities in making better decisions on acceptable levels of toxics in the environment. The benefits of the final rule include improvements in understanding, awareness, and decision making related to the provision and distribution of information on releases and waste management of lead and lead compounds.

The provision of information can lead to follow-on activities that create additional costs and benefits (see Table 6-1). As evidenced by the current TRI reporting, this information can lead to voluntary initiatives by industry to review production processes, set goals for reductions in emissions, and institute "good neighbor" policies. If an individual facility owner or operator perceives that the benefits outweigh costs, then he or she will implement changes to reduce releases of TRI chemicals.[1] Even when firms do not find it initially in their own interest to reduce releases, making TRI information available to the public may induce changes in the marketplace that provide incentives for firms to cut TRI chemical releases.

Social benefits derived from follow-on activities not required by the final rule may include decreased costs of waste treatment and disposal, lower probability of accidental releases, and lower clean-up costs in the event of such releases, reduced contamination of natural resources from decreased land disposal, improved air and water quality, and reduced risks to human health such as lower incidence of elevated blood lead levels and related medical costs. Such social benefits are offset by the social costs to implement the changes, such as installing scrubbers and substituting materials that are less toxic but more expensive. The net social benefits of the information provided by the final rule and the follow-on activities equal the difference between the benefits and the costs displayed in Table 6-1.

6.2.1 THEORETICAL BASIS FOR ASSESSMENT OF PBT INFORMATION BENEFITS

Pollution resulting from releases of lead and lead compounds to the environment suggests two distinct types of market failure: negative externalities and asymmetric information. As a consequence, economic theory suggests that the social benefits of having access to information on lead and lead compounds in order to address these market failures may be large.

This section develops a framework for discussing economic benefits of information resulting from the final rule. As in past regulations implementing EPCRA section 313, the objective of the final rule is to correct market failures, which inhibit the ability of the traditional economic pricing system to maximize social welfare.[2] Pollutants must either be physically altered and/or diluted in the environment so as not to cause health or environmental damages. Persistence and bioaccumulation in the environment requires that the benefits analysis appropriately address time and the diverse group of resource users and uses that are potentially affected. The following economic framework specifically accounts for the persistent and bioaccumulative nature of lead and lead compounds.

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[1] Companies that participated in EPA's 33/50 program fall into this category.

[2] It is a well established theory in modern economics that markets will fail to achieve socially optimal outcomes when differences exist between market and social values.

TABLE 6-1
POTENTIAL BENEFITS AND COSTS ASSOCIATED WITH THE FINAL RULE AND WITH FOLLOW-ON ACTIVITIES

Consequences of Activities Required by the Final Rule		
Activity	**Activity**	**Benefits**
Companies file Form R	Government publishes TRI information, thus providing additional information on chemical releases to the public	Improved scientific understanding of environmental and health risks Increased public awareness More informed decision-making by government, industry, and the public
[Industry cost]	[Government cost]	[Societal benefit]
Follow-On Activities (i.e., not required by the final rule)		
Activity	**Activity**	**Benefits**
Industry-initiated review of processes, goal-setting for reductions, institution of "good neighbor" policies, etc.	Implementation of changes in production, operation, and raw materials use by industry yield reductions in releases, treatment, and disposal of waste	Reduced waste disposal costs for industry Reduced clean-up costs arising from accidental releases Reduced third-party liability risk (thus, decreased risk management costs to industry) Reduced environmental and human health risks Improved preservation of natural resources
[Industry cost]	[Industry cost]	[Societal benefit]

Lead and Lead Compounds as Negative Externalities

Negative externalities exist when a production process imposes uncompensated (or "external") costs on another party. During manufacturing and other business activities, facilities may release pollutants or cause other environmental harm without accounting for the consequences of these actions. These costs may not be recognized by the responsible entity in the conventional market-based accounting framework. For example, a firm that produces and/or uses hazardous chemicals will pay for labor and capital but will not pay for environmental damages resulting from the emission of these hazardous chemicals. Because these costs are not recognized by the responsible entity, they are not considered in the consequent production and pricing decisions of the firm. To the extent that negative externalities are present, an overproduction and overuse of environmentally hazardous chemicals will occur and an inefficient level of environmental quality will result (Mills and Graves, 1986).

FIGURE 6-1
SOURCES OF MARKET FAILURE

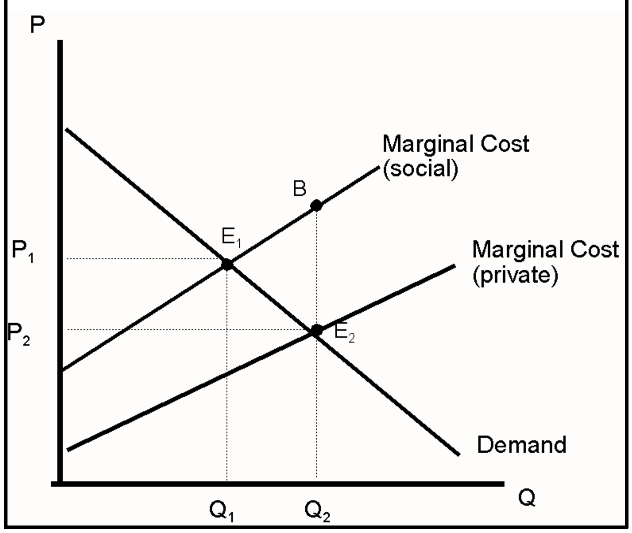


Figure 6-1 illustrates market failure in the case of external production costs. In the diagram, the marginal private cost curve is the firm's supply function. The demand curve represents society's willingness to pay. The private marginal cost curve differs from the social marginal cost curve by the dollar value of pollution damages (private costs + external costs). The intersection of marginal social cost and demand gives the socially optimal price (P_1) and quantity (Q_1). However, when pollution costs are not addressed, the equilibrium price is P_2 and the equilibrium quantity is Q_2. For each unit consumed beyond Q_1, the distance between the marginal social cost curve and the marginal private cost curve represents the cost to society imposed by the externality. Society is compensated for a portion of these costs, because consumers willingness to pay exceeds marginal private costs. The remainder, area E_1E_2B is referred to as the deadweight loss. This is a cost in the sense that with external costs present, a lower-value combination of goods and environmental quality is produced than would otherwise be achieved.

TRI information from the final rule may facilitate constructive activities that internalize the negative externality by bringing the marginal social cost curve and the marginal private cost curves closer together. This outcome may be achieved by either reducing the marginal social cost associated with production of the good Q, and/or by increasing the marginal private cost. Marginal private costs may be increased, for example, by a firm's expenditures on pollution control. Marginal social costs may be decreased by changes in the production process, for example, by substituting less toxic alternative inputs for lead and lead compounds.

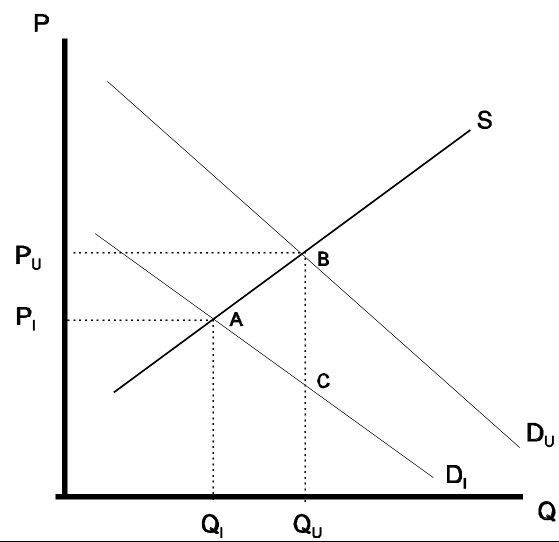
The paradigm of negative externalities assumes that consumers are informed about the health and environmental effects of contaminants. However, it may be impossible to link specific health and environmental effects with particular point-source dischargers. Under circumstances when markets do not provide such information, the TRI provides valuable data that may facilitate a market-based solution as described above.[3] The next section addresses market failure when the consumer informational assumption is not met.

Lead and Lead Compounds as an Asymmetric Information Problem

In economic theory, consumers and producers require complete information about all associated benefits and costs for resources to be efficiently allocated. Specifically, because of the persistent and bioaccumulative nature of lead and lead compounds, consumers may not have sufficient information regarding the health and environmental consequences of their purchasing decisions, and may or may not be aware of the limitations of the information they do have. This lack of information leads to inefficient market outcomes, a misallocation of resources, and diminished societal well-being.

Producers have a strong incentive to inform consumers of the positive aspects of their products in order to increase demand, but they do not ordinarily have an incentive to furnish consumers with information regarding the negative consequences associated with their products' use or production, such as the release of toxic chemicals to the environment. Lacking full information of the consequences of their purchases, consumers may over-value or under-value the goods in question.

FIGURE 6-2
INFORMATION PROVISION AND EFFICIENCY



[3] Economists have argued that it is theoretically possible for the firm to negotiate with members of the community about payments to compensate them for the damages they suffer, yielding an efficient distribution of resources even in the presence of externalities (Davis and Hulett, 1977). In his article *The Problem of Social Cost*, R. H. Coase suggests that public intervention is not necessary to correct market imperfections because the affected party may be able to pay the producer of the externality to reduce their activities which result in external costs or to implement pollution controls. Theoretically, the affected party would be willing to offer a "bribe" for incremental pollution reductions up to the point where marginal abatement costs and marginal damages are equal. Both parties would be better off up to this point because the incremental payments made by the affected party will not exceed their marginal damages (the affected party benefits) and the payments received by the firm will exceed their marginal costs of pollution abatement (the polluter benefits). A *socially* efficient level of production is achieved (the equity implications of this solution are not factored into this outcome). For the proper operation of the Coase Theorem, several conditions (which are generally unmet in cases of environmental pollution) must be present: 1) property rights must be well defined, enforceable, and transferable; and 2) transaction costs must be minimal in order to allow negotiation to occur (Field, 1994).

Generally, when consumers lack information regarding the negative consequences of their purchases, the result will be a misallocation of resources due to excess demand. The social cost or deadweight loss from *asymmetric information* is illustrated in Figure 6-2. In Figure 6-2, D_u represents the demand curve for Q when consumers are not fully informed. Similarly, D_i represents the demand curve for Q when consumers have all information relevant for purchasing decisions. The intersection between the market supply curve, S, and D_u and D_i determines the equilibrium price and quantities under each market setting, respectively. The equilibrium when consumers are uninformed is (P_u,Q_u), while the equilibrium for informed consumers is (P_i,Q_i). Uninformed consumers purchase greater amounts of Q at a higher equilibrium price as compared to informed consumers. As (P_i,Q_i) is the result that prevails in a properly operating market, the area ABC in Figure 6-2 is equal to the social cost.[4] Though this general description of the impact of consumers' lack of information is instructive, to properly assess the social benefits of the final rule, a further refinement in the characterization of the type of good being considered is required.

The type of good has a significant impact on the magnitude of the increase in efficiency resulting from government intervention to eliminate the information asymmetry. In an extension of Nelson (1970), Vining and Weimer (1988) and Boardman et al. (1996) describe three types of goods consumers may purchase. These goods are defined as 1) search goods—goods for which consumers can determine all relevant attributes before consumption; 2) experience goods—goods for which consumers can determine all relevant attributes only after consumption; and 3) post experience goods—goods for which consumers cannot determine all relevant characteristics immediately after consumption and may not become aware of all of these attributes for an indefinite period of time.

Asymmetric information characterizes the market for experience and post-experience goods.[5] For example, product repair frequency data for durable goods such as automobiles and large appliances constitute informational needs of consumers that may not reliably be met through primary market sources. Alternatively, consumers can accumulate information from secondary sources, such as certification services, agents, and subscription services.[6] Nelson (1970) defines the use of secondary sources of information as "guided sampling" and provides statistical

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[4] In addition to imposing a less than economically efficient outcome on society, asymmetric information causes a redistribution of social welfare from consumers to producers. Under the assumption that uninformed consumers overestimate the quality of Q, Figure 6-2 illustrates this redistribution is equal to the area P_uP_i,A,B. While the transfer of social welfare does not reduce aggregate economic benefits, measuring such transfers may be useful for addressing other important values such as equity and distribution.

[5] Search goods are associated with a low probability of information asymmetry and represent markets where consumers are actively seeking to make purchases. To the extent that heterogeneity in quality is present, or the frequency of purchase is low, asymmetric information may exist. However, the potential for information asymmetry is expected to be minimal as producers have strong incentives to provide information (e.g. advertising) that mitigates voids in consumer knowledge.

[6] Vining and Weimer (1988) provide examples of certification services, including professional associations and the Better Business Bureau. Subscription services include *Consumer Reports* as well as other similar publications. In addition, consumers may make inquiries with friends or relatives.

evidence that markets for secondary sources of information can function to provide relevant information for experience goods. These results suggest that government intervention in the market for experience goods is not generally required.

Unlike experience goods, the characteristics of post-experience goods remain unknown to the consumer indefinitely. In terms of Figure 6-2, this implies that deadweight losses, equal to the area ABC, occurs in every subsequent time period. In this situation a significant level of social costs will accrue.[7]

Vining and Weimer (1988) and Boardman et al. (1996) explain that markets for secondary sources of information related to post-experience goods fail to function effectively for several reasons. First, secondary sources may be unable to familiarize themselves with the characteristics of post-experience goods. Further, even though secondary sources may be able to collect relevant information, this process is likely to be very expensive.[8] Lastly, information has the characteristics of a "public good:" it is non-rival and non-excludable (depending on how it is made available). That is, once the information is gathered, one person's use of the information does not preclude another's use of the same information, and it is difficult to prevent uncontrolled distribution. Economic theory demonstrates that, absent some kind of collective action, the private market will fail to supply an economically efficient quantity of a public good (see the example in the box to the right). Vining and Weimer (1988) conclude

Efficient Provision of a Good

In economic theory, production and consumption of a good is "efficient" only if the cost of supplying the good is less than the value placed on the good by consumers (that value is often measured by the amount that people are "willing-to-pay" (WTP) for the good). For example, if it costs $10 to produce a hammer, and person A is WTP $5 for a hammer while person B is WTP $15 for the hammer, then the efficient production level is one hammer (purchased by B). Likewise, if B were only WTP $8 for the hammer, then no hammers would be consumed in an efficient market. In both cases, the free operation of a market should provide the efficient outcome (i.e., only B purchases a hammer in the first case; nobody purchases a hammer in the second case).

With public goods, however, free markets don't lead to efficient results. Consider the case of a unit of information, which costs $10 to provide. Person A is WTP $5 for the information; person B is WTP $8 for the information. Because neither person is WTP $10 for the information, it will not be provided. Since, however, A's use of the information does not preclude B's use of the information, the value of that unit of information to society as a whole is the sum of the individual values (i.e., $13). Since society as a whole is WTP more than the production cost of the information, then it is economically efficient to produce it. In the case of public goods such as information, efficient allocation is possible only with some sort of collective action (such as persons A and B cooperating to purchase the information).

[7] To assess the total value of the deadweight losses accurately over time, it is necessary to discount the value of these costs appropriately for all time periods beyond the initial period.

[8] This may especially true if negative attributes are of concern, as producers have little incentive to reveal this information.

that "...the strongest a priori rationale for public intervention on the grounds of information asymmetry arises in markets for post-experience goods."[9]

Boardman et al. (1996) provides examples of potential post-experience goods, including adverse health effects from a prescription drug or employees exposure to toxic chemicals. However, exposure to toxic chemicals is not limited to employees, but includes society as a whole. The persistent and bioaccumulative nature of lead and lead compounds places these chemicals in the category of post-experience goods. As discussed above, lead and lead compounds may have large-scale health and environmental effects that are likely to remain unrecognized by relevant parties for an indefinite period of time. Because lead and lead compounds are post-experience goods, the social costs that their health and environmental effects impose on society will accrue over time without appropriate information. For a number of reasons outlined above, secondary sources of information on lead and lead compounds are unlikely to function effectively. Extensive use of the existing TRI demonstrates the important role that government plays in providing information on toxic chemical releases. The persistent and bioaccumulative nature of lead and lead compounds and their appropriate characterization as post-experience goods suggests potentially significant social benefits from correcting market failure through the final rule.

Information: an Approach to Correcting Market Failure

The discussion presented above demonstrates that there is a strong likelihood that significant market failures exist for lead and lead compounds requiring government intervention. In the event of a significant market failure, public intervention is often required to achieve a more socially efficient outcome. Several alternative approaches are available to address market failure and to move society closer to an efficient allocation of resources: command-and-control (C&C) strategies, incentive-based strategies, and information-based strategies. C&C strategies tend to be less sensitive to differences in costs and benefits by setting standards for the quantities of pollutants a source may release. This approach is typically implemented by mandating specific control technologies (design standards) or specific environmental targets (performance standards). C&C strategies have been widely criticized on several grounds. By imposing a uniform standard across all facilities without consideration of the relative costs of emissions control, the standards approach forgoes possible savings that could be achieved by reallocating emissions reductions among firms in such a way as to achieve the same overall reductions but at a lower cost.

In addition to their efficiency shortcomings, C&C strategies will sometimes discourage technological innovation or create a weaker incentive for innovation than the incentive-based approaches discussed below. In the case of a technology-based standard, firms will tend to adopt the technology represented by the standard regardless of whether a better (i.e., less expensive or more effective) alternative exists in order to insure compliance. Also, in the case of a technology-based standard, no incentive exists for research and development (R&D). When faced with a performance standard, the incentive for engaging in R&D equals any avoided compliance costs;

[9] Vining and Weimer (1988), page 103.

however, this is a weaker incentive than is created by the incentive-based approach (Field, 1994). Thus far, the discussion has focused on the inefficiency of a uniform standard in achieving a specific emission level. This is a question of cost-effectiveness—does the regulatory approach achieve a given emission level at least cost? In order to insure an efficient allocation of resources, however, emissions must not only be reduced at least cost but must also be reduced to a socially efficient level. Information such as total releases, marginal abatement costs, and human and environmental damages are required to estimate an efficient level of emissions.

Both the incentive-based approach and information-based strategies have advantages compared to the standards approach. Incentive-based strategies, rather than mandating a uniform standard across all generators, place a price on every unit of pollution, creating an incentive for emitters to reduce their emissions. The most common approach is to set a charge per unit of pollution; however, other alternatives are also suggested in the literature, including tradeable discharge permits and abatement subsidies (Field, 1994). Incentive-based strategies may be able to reduce the same quantity of emissions at a lower cost compared to C&C strategies because an incentive is created for reductions to occur where it is least costly to do so. However, as with the standards approach, the regulating agency requires data in order to estimate the shapes of the aggregate marginal cost curve and the aggregate marginal benefit curve.

It is clear from the discussion above that information such as that produced by the final rule plays a integral role in C&C strategies and incentive-based approaches to environmental management and policy. However, information itself can function as a market-oriented strategy for improving environmental quality. As in the case of incentive-based strategies, information-based strategies provide a more market-oriented alternative to C&C approaches. Specifically, they can lead to more cost-effective reductions in chemical emissions by allowing facilities the flexibility to decide whether and how to make reductions. Information-based approaches are quite varied: government testing and rating systems, mandatory disclosure requirements such as labeling and periodic reporting, and government provision of information. Consumers may respond to the additional information by changing their purchasing decisions (increasing or decreasing their consumption), by changing the way they use a product, or by altering their choice of where to live and work. Producers, who may previously be unaware of implications of their actions, will have the necessary information made available to them. In cases where the market is unlikely to provide adequate information, public intervention can provide consumers and possibly producers with information that will allow them to make better decisions. The next section provides a general discussion of the various groups that may be able to use the TRI information that is gathered by the final rule.

6.2.2 POTENTIAL BENEFITS OF TRI INFORMATION BY USER GROUP

The potential benefits of additional TRI reporting can be understood by examining the ways in which different groups of economic actors—consumers, industry, non-federal governments and the general public—utilize the TRI data. Consumers may use the data to make more informed decisions about the products they buy and to enter into constructive dialogue with the lead-emitting firms in their communities. Industry may find opportunities for waste reduction and cost savings through developing data to be used for reporting under the final rule. Non-federal governments may use the data in lieu of or in support of their own environmental protection activities. In addition, non-users of the TRI data benefit from its public provision whenever others use of the data results in improvements in environmental quality.

Some examples of the ways in which various groups have utilized TRI data include:

- *Use of the Data by Community and Public Interest Groups*: Communities use TRI data to begin dialogues with local facilities and to encourage them to reduce their emissions, develop pollution prevention plans, and improve safety measures. Public interest groups use the data to educate the public about toxic chemical emissions and potential risk.

- *Use of the Data by Education and Research Institutions*: The TRI data are being used in many environmental education programs, particularly at the high school and university levels. Students learn about toxic chemical releases, the potential health and environmental effects of those releases, pollution prevention activities and opportunities, and the social and political aspects of environmental protection. Some organizations also are conducting educational outreach programs using TRI data.

- *Use of the Data by the Financial and Business Communities*: Investment analysts use TRI data to provide recommendations to clients seeking to make environmentally sound investments. Insurance companies look to TRI data as one indication of potential environmental liabilities. Consultants and others use the data to identify business opportunities, such as marketing pollution prevention and control technologies to TRI reporting facilities. Demand for environmental performance information by investors, insurance companies, and the public has led many companies to develop environmental annual reports similar to annual reports on financial performance traditionally prepared for investors.

- *Industry Use of TRI Data*: TRI has been used by industry for activities such as developing waste reduction strategies, and improving companies' understanding of their own production processes.

- *Government Use of TRI Data*: Government organizations such as the media-specific offices at EPA, EPA Regional offices, and other national, state, and local government agencies routinely use the TRI data. TRI data have been used to: identify hazardous air pollutants to be included in the Urban Area Source Program mandated by section 112(k) of the CAA; develop inspection targeting and enforcement tools; analyze long-term trends in waste minimization; identify candidates for the National Primary Drinking Water Regulations; and to set priorities and allocate increasingly scarce environmental protection resources to the most pressing problems.

6.3 ADDITIONAL INFORMATION ON RELEASES OF LEAD AND LEAD COMPOUNDS

Information on the extent of potential additional reporting on lead and lead compounds may be helpful in assessing the potential benefits associated with the final rule. Since the benefits of the final rule are related to the provision of additional information on releases and other waste management of lead and lead compounds, this section describes some of the information that may be generated by the final rule.

Understanding what information would be added by this final rule requires an examination of 1) lead and lead compounds currently reported to TRI, and 2) the total quantity of lead and lead compounds released and otherwise managed as waste. Unfortunately, due to a lack of existing comprehensive multi-media information on lead and lead compounds, it is not possible to determine how much of the total releases (and other waste management) of lead from TRI-reportable sectors is already reported to TRI. Therefore, this discussion is limited to air releases of lead and lead compounds—the one medium for which sector-level release estimates are available. Section 6.3.1 estimates the percentage of total lead and lead compound releases to air that is potentially reportable to TRI. Section 6.3.2 estimates the percentage of lead and lead compound releases to air that is already reported to TRI. Section 6.3.3 identifies some of the manufacturing sectors that appear to have currently unreported lead and lead compound releases to air.

6.3.1 LEAD AND LEAD COMPOUND RELEASES POTENTIALLY REPORTABLE TO TRI

Only lead and lead compound releases from sources that are subject to TRI is potentially reportable to TRI. TRI captures release and other waste management information from facilities in SIC codes that are subject to EPCRA Section 313. These facilities must have 10 or more employees, and they must manufacture, process, or otherwise use lead or lead compounds above threshold quantities. Certain releases and other waste management activities may not be subject to TRI reporting for the following reasons:

- They are not from facilities (e.g., cars, aircraft); or
- They are covered by a reporting exemption (e.g., motor vehicles, *de minimis*); or
- They are not from industry groups covered by TRI (e.g., residential combustion); or
- They are from facilities with fewer than 10 employees; or
- They are from facilities that manufacture, process, or otherwise use less than the reporting threshold.

Under the final rule, EPA seeks to increase the information reported to TRI on lead and lead compound releases and other waste management by lowering the reporting threshold and by eliminating the *de minimis* exemption. These changes should cause more facilities subject to EPCRA section 313 to report.

To estimate the proportion of total lead and lead compounds that are potentially reportable to TRI, it would be necessary to know 1) the total releases of lead and lead compounds to all media, 2) the total amount of lead and lead compounds managed as waste, and 3) the relative magnitude of releases and other waste management from all sources, including those that are not reportable to TRI. For facilities not currently reporting to TRI and sectors that do not report to TRI, most of this information is unavailable.

Air is the only medium for which fairly comprehensive, sector-level information on lead and lead compound releases is available. Estimates of releases of lead to air are available in the National Air Pollutant Emissions Trends (NET) Report prepared by EPA's Office of Air Quality (EPA, 1998b). The NET report is not a substitute for TRI for community right-to-know purposes.[10] However, it does allow the crude estimation of the relative magnitude of lead and lead compound releases to air from all sectors—whether reportable to TRI or not (see Table 6-2).

Based on estimates for 1996 in the NET report, up to 84 percent of lead and lead compound releases to air are potentially reportable to TRI. This percentage will actually be somewhat lower because some of the sectors classified as "TRI sectors" in Table 6-2 may include facilities or other sources that are not in TRI-reportable SIC codes (e.g., Waste disposal-other and Fuel combustion-other). Additionally, facilities with fewer than 10 employees are not required to report to TRI.

Extending this conclusion to lead and lead compound releases from other environmental media may not be appropriate. To do so would require assuming that various sources release lead and lead compounds to other media in the same proportion as they do to air. This conclusion would be stronger if most lead and lead compounds were released to air. However, based on 1996 TRI reporting, approximately 90 percent of on-site releases of lead and lead compounds are to land, with less than 10 percent of releases to air (EPA, 1998a). Unlike air, the relative contributions of TRI and non-TRI sources to land and water releases are not known.

Likewise, it may be difficult to extend this conclusion to other waste management of lead and lead compounds. Based on 1996 TRI reporting, the quantity of lead and lead compounds managed as waste is more than 25 times the quantity released to air, land, and water (EPA, 1998a). The relative contributions of TRI and non-TRI sources to total quantities of lead and lead compounds treated or recycled are not known.

[10] The NET report has a number of limitations for community right-to-know purposes: (1) air is the only environmental medium covered by the report, (2) the estimates are derived using a "top-down" approach that depends on emission factors and sector-level activity information, (3) the estimates are not facility- or region-specific, (4) estimates are not available for all sectors that TRI indicates contribute to air releases, and (5) the report does not provide any waste management or pollution prevention information.

TABLE 6-2
ESTIMATED NATIONAL RELEASES OF LEAD TO AIR, 1996

Sector	Amount (lbs)	Percent	Percent of Total
TRI sectors			
Metals processing	4,104,000	62.3%	52.5%
Waste disposal-other[11]	1,092,000	16.6%	14.0%
Fuel combustion-other[12]	800,000	12.1%	10.2%
Chemical manufacturing	334,000	5.1%	4.3%
Fuel combustion-electric utilities	122,000	1.9%	1.6%
Other industrial	102,000	1.5%	1.3%
Fuel combustion-industrial	32,000	0.5%	0.4%
Total TRI Sectors	**6,586,000**	**100.0%**	**84.2%**
Non-TRI sectors			
Non-road engines and vehicles	1,010,000	81.8%	12.9%
Waste disposal-municipal	152,000	12.3%	1.9%
On-road vehicles	40,000	3.2%	0.5%
Fuel combustion-residential/commercial	32,000	2.6%	0.4%
Total non-TRI sectors	**1,234,000**	**100.0%**	**15.8%**
Total all sectors	**7,820,000**	**--**	**100.0%**
Source: NET report (EPA, 1998b)			

6.3.2 ADDITIONAL INFORMATION ON LEAD AND LEAD COMPOUNDS CAPTURED BY THE FINAL RULE

As of 1996, there were 1,623 facilities reporting releases of almost 36 million pounds of lead and lead compounds in TRI (EPA, 1998a). It is difficult to estimate how much of the total lead and lead compound releases from TRI-reportable sectors is already reported to TRI since

[11] This source represents combustion of waste. Some waste may be combusted at industrial facilities. The remainder is combusted at commercial and institutional facilities in SIC codes that are not reportable to TRI.

[12] This source represents combustion of waste oil containing lead. Some waste oil may be combusted in industrial boilers. The remainder is combusted at service stations, auto repair shops, and other facilities in SIC codes that are not reportable to TRI.

information on *current* reporting of releases to land and water does not assist in estimating *potential* reporting. To estimate potential reporting of lead and lead compound releases, comprehensive multi-media information is required. However, air is the only medium for which fairly comprehensive, sector-level information on lead and lead compound releases is available. Therefore, the discussion of potential additional reporting of release information is limited to air releases.

The NET report estimates that 5,372,000 lbs of lead and lead compounds were released to air by manufacturing industries in 1996. In this same year, only 1,805,420 lbs of air releases were reported to TRI by facilities in the manufacturing sectors.[13] Comparing the total air releases reported to TRI for lead and lead compounds with the estimated total air releases for manufacturing industries from the NET report yields an estimate of approximately 65 percent of potential releases to air unreported from TRI-reportable sectors.[14] Extending this conclusion to total lead and lead compound releases would require an assumption that sectors release lead to other media in the same proportion as to air. As noted before, land releases are the largest component of on-site releases with air releases accounting for less than 10 percent of all on-site releases (EPA, 1998a).

The previous approach accepts the NET report estimates at face value. It is possible, however, that the NET report systematically under- or overestimates releases of lead to air because of its "top-down" methodology. To evaluate this possibility, TRI and NET release amounts for 7 industry sectors were compared.[15] These sectors were selected because they may be near "full" TRI reporting for lead and lead compounds.[16] Therefore, the TRI-*reported* amounts would be expected to be similar to NET-*estimated* amounts. In addition, the 7 sectors collectively account for a large proportion of TRI-reportable emissions to air as estimated by the NET report. Table 6-3 shows the 7 sectors, the number of facilities currently reporting to TRI, the estimated number of facilities that may be eligible to report (based on employment), the air releases reported to TRI, and the air releases estimated by the NET report.

If these sectors are at or near full reporting, then it appears that the NET report tends to overestimate air releases (primary copper smelting is a significant exception). For these 7 sectors

[13] TRI release amounts from Section 5.1 and 5.2 of Form R. For a valid comparison, release estimates for electric utilities and waste disposal in 1996 must be excluded because these sectors were not required to report to TRI in that year.

[14] This percentage may change as amounts from electric utilities and commercial hazardous waste disposal facilities (reporting for the first time in 1998) are added into the numerator and denominator.

[15] Exact matching of facilities reporting to TRI with SIC codes can be challenging. Facilities may choose multiple SIC codes. For the table, the primary SIC code selected by a facility was used to match TRI reports to SIC codes.

[16] These sectors may be near "full" or complete TRI reporting because all or most facilities with 10 or more employees currently report to TRI. The remaining facilities are exempt from TRI reporting because they have fewer than 10 employees.

considered together, it appears that 1 pound of release is estimated in the NET report for every 0.42 pounds actually reported to TRI. Applying this factor to the total estimate for manufacturing industries from the NET report yields a smaller adjusted estimate (5,372,000 lbs x 0.42 = 2,300,000 lbs) of total air releases for manufacturing industries. If releases reported to TRI for lead and lead compounds (1,805,420 lbs) are compared with the adjusted NET report estimates (2,300,000 lbs), it appears that TRI already captures information on approximately 80% of lead releases to air. Again, this percentage may change as amounts from electric utilities and commercial hazardous waste disposal facilities (reporting for the first time in 1998) are added into the numerator and denominator. The same caveats about applying this result to releases to other media and to amounts of waste managed apply here as well.

TABLE 6-3
TRI VS. NET EMISSIONS OF LEAD AND LEAD COMPOUNDS TO AIR FOR INDUSTRIES NEAR FULL TRI REPORTING, 1996

Sector	SIC Code	# TRI reports	# facilities eligible to report[a]	TRI amount (lbs)	NET estimate (lbs)
Primary lead	3339	10	4	599,622	1,202,000
Primary zinc					
Primary copper	3331	6	6	247,023	44,000
Secondary lead	3341	64	20	157,793	1,118,000
Secondary copper			2		
Secondary aluminum[b]			53		
Storage battery mfg[c]	3691	75	98	75,653	206,000
Total				**1,080,091**	**2,570,000**

[a] USGS Mineral Commodity Surveys (1998), USGS Mineral Yearbooks (1997), and USDOC County Business Patterns (1996).
[b] Secondary Aluminum is not identified as a source in NET. It is assumed that the 64 TRI facilities reporting a primary SIC of 3341 includes the 20 secondary lead facilities and the 2 secondary copper facilities. As a class, throughput of lead at secondary aluminum facilities is expected to be small relative to secondary lead and copper facilities (<0.01%) (see Appendix A).
[c] If the 75 facilities in SIC 3691 already reporting to TRI are the largest facilities in the SIC code, then the remaining 23 facilities account for less than 3% of economic activity in the sector (see Appendix A).

6.3.3 SECTORS WITH LEAD AND LEAD COMPOUNDS RELEASES TO AIR NOT CURRENTLY REPORTED TO TRI

Another possible use of TRI/NET comparisons is to identify TRI-reportable sectors for which there appear to be unreported releases. This may be due to current reporting thresholds, and/or to the *de minimis* exemption. Analysis of certain manufacturing sectors that are not near full reporting, however, suggests that even if the adjustment factor of 0.42 is applied to the NET air emissions, TRI currently captures a much lower percentage of total air releases for some industry sectors than NET indicates is available.[17] As shown in Table 6-4, current TRI coverage for industry sectors where significant additional reporting is expected due to the final rule ranges from 4% to 29% of total emissions. At the preferred option presented in the regulatory text (100-pound reporting thresholds), most of these "missing" facilities would be expected to report to TRI.

TABLE 6-4
TRI VS. NET EMISSIONS OF LEAD AND LEAD COMPOUNDS TO AIR FOR SELECTED SECTORS, 1996

<table>
<tr><th>Sector</th><th>SIC Code</th><th># TRI reports</th><th># facilities eligible to report[a]</th><th>TRI amount (lbs)</th><th>Adj. NET estimate (lbs)</th><th>Current TRI Coverage</th></tr>
<tr><td>Cement manufacturing</td><td>3241</td><td>13</td><td>136</td><td>6,734</td><td>24,360</td><td>29%</td></tr>
<tr><td>Electro-metallurgical products (ferroalloys)</td><td>3313</td><td>5</td><td>29</td><td>587</td><td>6,720</td><td>9%</td></tr>
<tr><td>Gray/ductile iron foundries</td><td>3321</td><td>20</td><td>492</td><td rowspan="2">54,890</td><td rowspan="2">303,240</td><td rowspan="2">19%</td></tr>
<tr><td>Malleable iron foundries</td><td>3322</td><td>2</td><td>15</td></tr>
<tr><td>Steel investment foundries</td><td>3324</td><td>1</td><td>124</td><td rowspan="2">4,798</td><td rowspan="2">134,400</td><td rowspan="2">4%</td></tr>
<tr><td>Steel foundries, n.e.c.</td><td>3325</td><td>8</td><td>225</td></tr>
<tr><td colspan="2">Total</td><td>49</td><td>1,021</td><td>67,009</td><td>468,720</td><td>14%</td></tr>
<tr><td colspan="7">[a] USGS Mineral Commodity Surveys (1998), USGS Mineral Yearbooks (1997), and USDOC County Business Patterns (1996).</td></tr>
</table>

[17] TRI release amounts from Section 5.1 and 5.2 of Form R.

6.4 CONCLUSIONS

Economic theory suggests an important role for government action in the form of the final rule because of the persistent and bioaccumulative nature of lead and lead compounds. Because of their intrinsic characteristics and the lack of incentives for voluntary reporting from TRI facilities, lead and lead compounds fit the definition of post-experience goods—goods whose attributes remain unknown for an indefinite period of time. In the case of post-experience goods, a significant asymmetric information problem exists. In the absence of government intervention, private market forces are unlikely to address the public's need for information.

An examination of the data on air releases indicates that there are a number of industry sectors for which comprehensive TRI reporting on lead and lead compounds is currently lacking. It is unlikely that release or other waste management information will be available from facilities in these sectors without the final rule. Due to this current lack of information on total releases and other waste management activities, the amount of lead and lead compounds that will be reported as a result of the final rule cannot be quantified with precision. However, the final rule will result in more comprehensive reporting on lead and lead compounds.

There are two types of benefits associated with additional TRI reporting of lead and lead compounds: those resulting from the actions required by the rule (such as reporting and recordkeeping), and those derived from follow-on activities that are not required by the rule. Benefits of activities required by the rule include the value of improved knowledge about the release and waste management of lead and lead compounds, which leads to improvements in understanding, awareness and decision making. It is expected that this rulemaking will generate such benefits by providing readily accessible information that otherwise would not be available to the public.

The second type of benefits derive from changes in behavior that may result from the TRI information. These changes in behavior, including reductions in releases of and changes in the waste management practices for lead and lead compounds may yield health and environmental benefits. These changes in behavior come at some cost, and the net benefits of the follow-on activities are the difference between the benefits of decreased lead releases and transfers and the costs of the actions needed to achieve the decreases.

Because the state of knowledge of the economics of information is not highly developed, it is not possible to monetize the benefits of changing reporting thresholds for lead and lead compounds. Furthermore, because of the inherent uncertainty in the subsequent chain of events, it is not possible to predict the exact changes in behavior that will result from the information, or the resultant net benefits, (i.e., the difference between benefits and costs of follow-on activities). Currently, adequate methodologies to make reasonable monetary estimates of either the benefits of the activities required by the final rule, or the follow-on activities do not exist.

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APPENDIX A
LEAD AND LEAD COMPOUNDS

A.1 CHEMICAL PROFILE

Lead (CASRN 7439-92-1) is a heavy, silver-white metal in its pure (elemental) form. When exposed to air, it oxidizes and turns bluish-gray. Its significant physical properties include a low melting point (327°C), high density, chemical resistance, and an ability to shield radiation, sound waves, and mechanical vibrations. Lead and lead compounds are used in a variety of applications including lead-acid batteries, ammunition, building construction, solder, and metal castings, particularly when alloyed with metals such as antimony, tin, arsenic, or copper. Lead compounds are used in glass and ceramic products, plastics, paints, electrical cable coverings, and lubricating oils and greases (U.S. EPA, 1998a). In 1998, an estimated 3.8 billion pounds of lead were consumed in product uses in the United States (USGS, 1999a). Lead is also a trace constituent in ores and fuels.

A.1.1 PRODUCTION

Secondary lead production accounts for approximately 76 percent of domestic lead production and is carried out at 29 smelting facilities, generating an estimated 2.28 billion pounds of lead in 1998. In 1997, approximately 98 percent of the secondary lead was produced by seventeen smelters operated by ten companies. Nearly 90 percent of secondary lead is generated from scrap lead-acid batteries (USGS, 1999a; 1998a). Furnaces are used to reduce lead compounds in scrap lead to elemental lead, which may then be refined or alloyed (U.S. EPA, 1998a).

Primary lead mining involves the extraction of galena, a mineral consisting of lead sulfide (PbS). Extractable amounts of lead may also be found in other minerals, including anglesite ($PbSO_4$), cerussite ($PbCO_3$), and some zinc-bearing ores (U.S. EPA, 1998a; USGS, 1998b). Most lead mining in the United States occurs in Missouri (76 percent of total lead mine production in the United States in 1992). However, significant mines also are located in Alaska, Colorado, Idaho, and Montana. Currently, there are sixteen lead-producing mines in the United States operated by eight companies, including ASARCO Incorporated and The Doe Run Company. Three smelters, operated by two of those companies, process the lead ore, yielding an estimated 728 million pounds of lead in 1998 (USGS, 1999a, 1998a; U.S. EPA, 1998a).

A.1.2 USES

Lead and lead compounds are used in the manufacture of a variety of products. Domestic consumption of lead by product in 1997 is presented in Table A-1. The most prominent uses of lead and lead compounds are described below.

The manufacture of batteries is the largest lead-consuming process in the United States, accounting for 87 percent of lead consumption in 1997 (USGS, 1998a). Lead compounds are used in batteries because of lead's resistance to the corrosiveness of sulfuric acid and because it is an inexpensive material. Lead-antimony alloys are typically used for the internal grid of the battery, as well as for the posts connecting the battery to the apparatus being powered. Lead-acid batteries are used for starting, lighting, and ignition (SLI) in automobiles and other mobile devices, as well as stationary industrial uses such as uninterruptible power sources for hospitals and computer networks.

TABLE A-1
U.S. CONSUMPTION OF LEAD BY PRODUCT, 1997

Product	**Consumption (million lbs)**	**Percent**
Storage batteries	3,066	87.0%
Oxides, pigments, and ceramics products	149	4.2%
Ammunition, shot, and bullets	122	3.5%
Sheet lead	42	1.2%
Casting metals	40	1.2%
Solder	22	0.6%
Miscellaneous	19	0.5%
Other metal products	17	0.5%
Cable covering, power, and communication	11	0.3%
Brass and bronze, billets and ingots	10	0.3%
Bearing metals	5	0.2%
Pipes, traps, and other extruded products	4	0.1%
Caulking lead, building construction	3	0.1%
TOTAL	**3,510**	**100.0%**

Source: USGS, 1998a

Lead is used extensively in the ceramics industry. Lead compounds are incorporated into glazes and enamels applied to ceramic products to enhance physical performance traits. Lead additives improve the durability, color, scratch resistance, and bonding of the glaze. Lead content in foodware, however, is restricted to reduce health hazards (U.S. EPA, 1998a). When alloyed with zirconium and titanium, lead plays an important role as a component of ceramics in electronics applications because of its physical characteristics and higher-temperature applications (U.S. EPA, 1991). Lead is also used extensively in the glass industry for many of its physical properties, including high density and ability to absorb radiation (television and X-ray shielding), excellent insulation and low melting point (fluorescent lights and neon signs), and high index of refraction (optical glass) (U.S. EPA, 1998a; SGCD, 1999).

Lead is commonly used in ammunition because of its high density. The concentration of lead in ammunition is typically 99.7 to 99.9 percent; however, lead is sometimes alloyed with antimony, tin, or arsenic to increase the melting temperature, hardness, or surface tension of the bullets or pellets. In 1997, 122 million pounds of lead were consumed for ammunition, most of it from secondary (recycled) lead (USGS, 1998a).

Various other industries use metal products containing lead and lead compounds. These metal products include sheet lead, casting metals, solder, bearing metals, extruded products, and brass and bronze alloys. Lead is incorporated because of its malleability, ability to absorb radiation, density, and lubrication properties. In 1997, 140 million pounds of lead in such products were consumed.

A.1.3 RELEASES

Aside from the Toxic Release Inventory, no comprehensive, multimedia, national estimates of lead releases and other waste management are currently available. However, using a "top-down" emission factor approach, EPA has estimated that approximately 7.8 million pounds of lead were released to air by anthropogenic sources in 1996. Of this amount, 58.1 percent (4.5 million pounds) was estimated to be emitted by manufacturing sources, 28.5 percent (2.2 million pounds) resulted from waste or fossil fuel combustion at point sources, and 13.4 percent (1.0 million pounds) was generated from mobile sources (U.S. EPA, 1998b).[1] Table A-2 summarizes the estimated 1996 emissions of lead to air by source category.

Nonferrous and ferrous metals processing (smelting and refining) is associated with the largest air releases of lead, generating an estimated 3.5 million pounds of lead emissions in 1996 (U.S. EPA, 1998b). A large portion of the emissions is from fugitive dust generated from lead-containing ore, while additional emissions originate from furnace exhaust. Primary lead production is the largest source of lead air emissions within metals processing with an estimated 1.2 million pounds of lead emitted, followed by secondary lead production, gray iron production, and steel production (U.S. EPA, 1998b).

Another significant source of lead emissions to air is waste incineration. In 1996, an estimated 1.2 million pounds of lead were emitted from incinerators. Of this amount, an estimated 152,000 pounds were emitted by municipal waste incinerators, while the remainder was emitted by various industrial and hazardous waste incinerators, including those incinerating medical, hazardous, sewage sludge, and industrial materials. The lead content of the emissions depends heavily on the material burned; for example, medical waste containing bags with lead-containing red pigment will have high lead emissions, while a hazardous waste incinerator burning mostly organic solvents will have low lead emissions (U.S. EPA, 1998b). U.S. EPA has recently issued standards to reduce air emissions (including lead) from medical waste incinerators and municipal waste combustors. U.S. EPA has also revised emission standards for hazardous waste incinerators for the same purpose.

[1]These estimates were based on emission factors applied to measures of national activity (e.g., fuel consumption or raw material throughput) for each emission source. It should be noted that this approach underestimates total releases, at least for manufacturing sources. Releases from manufacturing sources as reported to TRI totaled over 300 million pounds as shown in Tables A-3 and A-4. Additionally, this approach does not identify some of the manufacturing sectors with the largest releases as reported to TRI.

TABLE A-2
ESTIMATED TOTAL U.S. EMISSIONS OF LEAD TO AIR, 1996

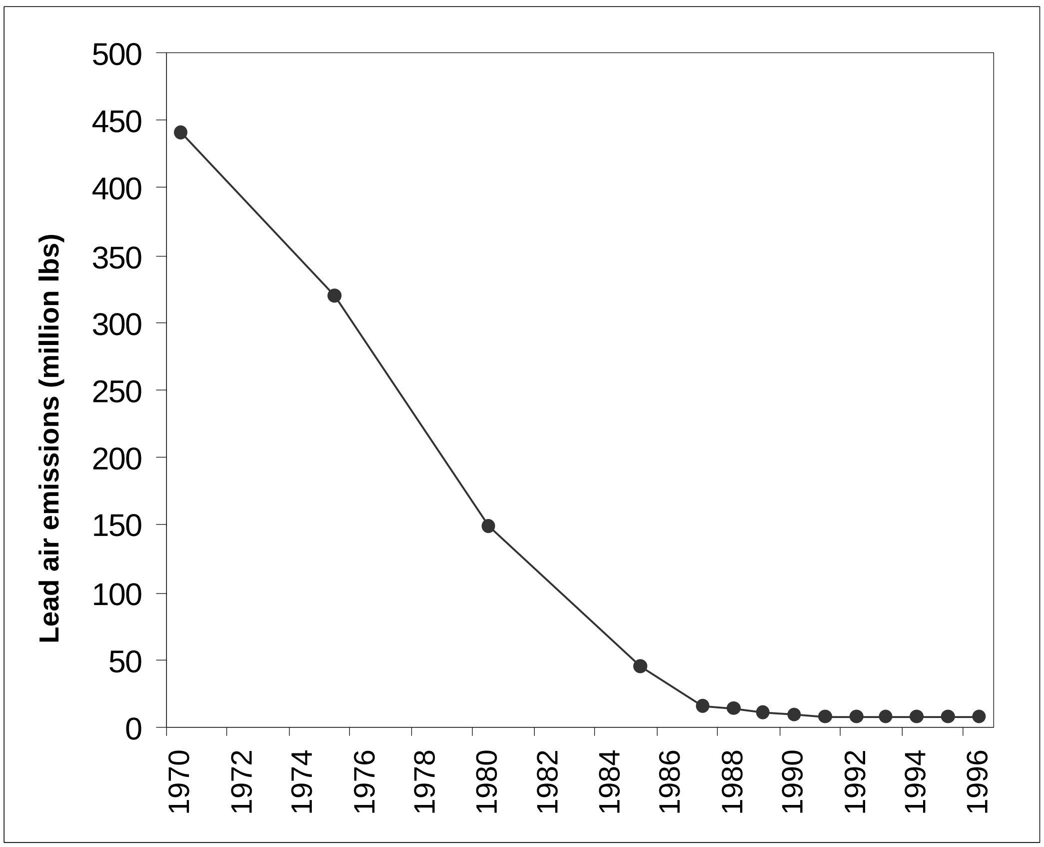
Source Category	Emissions (pounds)	Percent
Manufacturing Sources [a]	**4,114,000**	**52.6%**
Nonferrous metals processing	2,426,000	31.0%
primary lead production	*1,176,000*	*15.0%*
primary copper production	*44,000*	*0.6%*
primary zinc production	*26,000*	*0.3%*
secondary lead production	*1,028,000*	*13.1%*
secondary copper production	*152,000*	*1.9%*
Ferrous metals processing	1,058,000	13.5%
ferroalloy production	*16,000*	*0.2%*
iron production	*36,000*	*0.5%*
steel production	*320,000*	*4.1%*
gray iron production	*686,000*	*8.8%*
Lead oxide and pigments	334,000	4.3%
Lead battery manufacture	206,000	2.6%
Cement manufacturing	58,000	0.7%
Cable covering	32,000	0.4%
Combustion Sources	**2,230,000**	**28.5%**
Electric utilities [b]	122,000	1.6%
coal	*104,000*	*1.3%*
oil	*16,000*	*0.2%*
Industrial	32,000	0.4%
coal	*26,000*	*0.3%*
oil	*6,000*	*0.1%*
Other fuel	832,000	10.6%
Waste incineration	1,244,000	15.9%
municipal waste	*152,000*	*1.9%*
other waste incineration	*1,092,000*	*14.0%*
Mobile Sources	**1,050,000**	**13.4%**
On-road vehicles	40,000	0.5%
Non-road engines and vehicles	1,010,000	12.9%
Other Industrial Processes	**428,000**	**5.5%**
Metal mining	384,000	4.9%
Miscellaneous industrial processes	44,000	0.6%
TOTAL	7,822,000	100.0%

Source: U.S. EPA, 1998b
a. Total for Manufacturing Sources does not sum exactly due to rounding.
b. Electric utility numbers in U.S. EPA, 1998b do not sum to total (given in short tons).

Lead emissions from piston-engine aircraft (1.0 million pounds) generate the bulk of mobile source lead emissions (U.S. EPA, 1998b). While the Clean Air Act banned the use of lead in motor vehicle gasoline in the United States after 1995, lead is still used as a fuel additive in gasoline for piston-engine aircraft (U.S. EPA, 1998a).

There have been significant reductions in the amount of lead released to air over the past three decades. In 1970, an estimated 442 million pounds of lead were released to air, of which 78 percent were emitted from on-road vehicles. From 1970 to 1996, estimated lead air emissions were reduced 98 percent, mostly as a result of a ban on leaded gas for motor vehicles (U.S. EPA, 1998b). See Figure A-1 below. Lead emissions have also been reduced due to restrictions limiting lead content in plumbing pipes and paints.

FIGURE A-1
ESTIMATED TOTAL U.S. EMISSIONS OF LEAD TO AIR, 1970 - 1996



A.2 CURRENT TOXIC RELEASE INVENTORY STATUS

Lead and lead compounds are currently listed chemicals on the Toxic Release Inventory (TRI). The current reporting thresholds are 25,000 pounds per year for manufacturing (including importing) or processing, and 10,000 pounds per year for otherwise using lead and lead compounds.

Under current reporting requirements, there is an exemption for toxic chemicals in mixtures or trade name products below *de minimis* concentrations. The concentration is 0.1 percent for lead and inorganic lead compounds, and 1.0 percent for organic lead compounds. The manufacture as an impurity, processing, or otherwise use of lead and lead compounds in mixtures or trade name products below the *de minimis* level is exempt from reporting. The *de minimis* exemption does not apply to the manufacture of lead or lead compound byproducts or waste.

In 1998, a total of 1,902 unique facilities reported to TRI for lead and/or lead compounds. While there have been fluctuations from year to year, total air emissions in 1998 have declined 43 percent from 1988 baseline reporting. Further, while on-site releases declined 46 percent between 1988 and 1997, they increased 93 percent between 1997 and 1998. This increase is largely due to the addition of several industry sectors beginning in the 1998 reporting year, most notably metal mines. Since 1991, total off-site transfers have increased 40 percent (U.S. EPA, 1999a).

The total releases of lead and lead compounds (excluding recycling) as reported to TRI in 1998 are presented in Tables A-3 and A-4. Facilities reported the quantity of toxic chemical released in Section 8.1 of Form R; this quantity includes "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing [on-site or off-site] into the environment (including the abandonment of barrels, containers, and other closed receptacles)." Total Section 8 quantities are: the total quantity released (8.1); quantity used for energy recovery on-site (8.2) and off-site (8.3); quantity recycled on-site (8.4) and off-site (8.5); quantity treated on-site (8.6) and off-site (8.7); and quantity released to the environment "as a result of remedial actions, catastrophic events, or one-time events not associated with production processes" (8.8) (U.S. EPA, 1999c). Tables A-3 and A-4 show lead and lead compound releases both with and without the quantity recycled on-site and off-site.

A.2.1 LEAD

The Section 8.1 releases of lead from TRI facilities equaled 22.7 million pounds in 1998. A total of 26.9 million pounds of lead was reported for Section 8, excluding recycling. The top three industries reporting lead (by number of reports) were the following:

- Primary metal industries (SIC 33);
- Fabricated metal products, except machinery and transportation equipment (SIC 34); and

- Electronic and other electrical equipment and components, except computer equipment (SIC 36).

The top three industries reporting lead (by total Section 8 quantities excluding recycling) were slightly different:

- Refuse systems (SIC 4953),
- Primary metal industries (SIC 33), and
- Fabricated metal products (SIC 34).

A.2.2 LEAD COMPOUNDS

The Section 8.1 releases of lead compounds from TRI facilities equaled almost 290 million pounds in 1998. Over 300 million pounds of lead compounds were reported for Section 8, excluding recycling. The top three industries reporting lead compounds (by number of reports) were the following:

- Primary metal industries (SIC 33);
- Electric services (SIC 4911); and
- Electronic and other electrical equipment and components, except computer equipment (SIC 36).

The top three industries reporting lead compounds (by total Section 8 quantities excluding recycling) were slightly different:

- Metal mining (SIC 10);
- Primary metal industries (SIC 33); and
- Refuse systems (SIC 4953).

TABLE A-3
SUMMARY OF TRI REPORTING FOR LEAD, 1998

SIC Code and Name	Number of Facilities	Number of Form R Reports	Number of Form A Reports	Section 8.1 Releases (pounds)	Total Section 8 Quantities (pounds)	Total Section 8 Quantities, Excluding Recycling (pounds)
No SIC reported	2	2	0	39,509	53,017	39,509
10 - Metal mining	9	8	1	444,949	446,049	444,949
12 - Coal mining	4	0	4	--	--	--
22 - Textile Mill products	1	1	0	0	0	0
24 - Lumber and wood products except furniture	2	1	1	3,367	3,367	3,367
25 - Furniture and fixtures	4	3	1	9,536	65,485	19,072
26 - Paper and allied products	1	1	0	--	10,334	--
28 - Chemicals and allied products	15	11	4	9,901	125,785	14,945
29 - Petroleum refining and related industries	14	10	4	2,833	3,155	2,976
30 - Rubber and misc plastic products	20	18	2	17,570	814,707	36,302
32 - Stone, clay, glass, and concrete products	25	23	2	67,141	6,289,243	431,669
33 - Primary metal industries	253	228	25	6,432,432	245,245,857	8,562,985
34 - Fabricated metal products, except machinery and transportation equipment	203	180	23	1,080,911	16,991,833	1,144,434
35 - Industrial and commercial machinery and computer equipment	49	42	7	5,608	802,658	10,456
36 - Electronic and other electrical equipment and components, except computer equipment	96	86	10	366,858	13,610,170	428,622
37 - Transportation equipment	78	64	15	1,050,608	8,246,915	1,059,367
38 - Measuring and analyzing instruments	13	12	1	12,706	340,276	12,719
39 - Miscellaneous manufacturing industries	11	6	5	24,275	92,232	29,882
4911 - Electric services	16	14	2	367,473	367,473	367,473
4931 - Electric & other services	1	1	0	14,876	14,876	14,876
4953 - Refuse systems	23	23	0	12,645,894	14,067,649	14,036,625
5169 - Chemicals and allied products, n.e.c.	4	1	3	70	70	70
5171 - Bulk Petroleum	4	3	1	414	828	414
7389 - Solvent recovery services	1	1	0	0	52,364	52,364
87 - Engineering, Accounting, research, management, and related services	2	2	0	21,190	322,825	31,358
92 - Justice, public order, and safety	2	2	0	98,697	144,319	103,402
97 - National security and int'l. Affairs	2	2	0	26,121	85,121	26,121
Invalid SIC code	1	1	0	--	1	--
Total	**856**	**746**	**111**	**22,742,939**	**308,196,609**	**26,873,957**

Source: Toxic Release Inventory (U.S. EPA, 1999a)

TABLE A-4
SUMMARY OF TRI REPORTING FOR LEAD COMPOUNDS, 1998

SIC Code and Name	Number of Facilities	Number of Form R Reports	Number of Form A Reports	Section 8.1 Releases (pounds)	Total Section 8 Quantities (pounds)	Total Section 8 Quantities, Excluding Recycling (pounds)
No SIC reported	1	1	0	10	9,314	10
10 - Metal mining	40	39	1	208,175,220	208,924,887	208,187,912
12 - Coal mining	3	3	0	299,000	299,000	299,000
22 - Textile Mill products	6	6	0	11,907	44,149	13,578
24 - Lumber and wood products except furniture	2	2	0	60	20,414	60
25 - Furniture and fixtures	3	3	0	50,300	50,300	50,300
26 - Paper and allied products	1	1	0	59	39,740	59
28 - Chemicals and allied products	136	105	31	593,389	6,180,703	2,421,039
29 - Petroleum refining and related industries	27	22	5	93,736	103,972	102,879
30 - Rubber and misc plastic products	87	68	19	93,817	583,578	123,553
32 - Stone, clay, glass, and concrete products	56	54	2	3,528,509	93,818,384	3,703,890
33 - Primary metal industries	259	246	16	45,873,698	306,450,807	46,582,979
34 - Fabricated metal products, except machinery and transportation equipment	48	44	4	117,340	2,196,410	148,675
35 - Industrial and commercial machinery and computer equipment	12	11	1	23,302	627,679	23,683
36 - Electronic and other electrical equipment and components, except computer equipment	131	130	1	1,771,229	351,105,737	1,964,758
37 - Transportation equipment	46	42	4	103,186	2,119,311	130,018
38 - Measuring and analyzing instruments	4	4	0	315	83,227	388
39 - Miscellaneous manufacturing industries	3	3	0	540	52,543	1,144
4911 - Electric services	156	155	2	7,969,935	8,065,179	8,060,772
4931 - Electric & other services	1	1	0	21,000	21,000	21,000
4953 - Refuse systems	37	37	0	20,663,756	37,774,431	29,243,640
5169 - Chemicals and allied products, n.e.c.	2	1	1	NR	NR	NR
5171 - Bulk petroleum	1	1	0	0	0	0
7389 - Solvent recovery services	1	1	0	113,050	113,050	113,050
87 - Engineering, accounting, research, management, and related services	1	1	0	23	23	23
97 - National security and int'l. Affairs	2	2	0	887	39,030	39,030
Invalid SIC code	2	2	0	98,726	101,113	98,731
Total	**1,068**	**985**	**87**	**289,602,994**	**1,018,823,981**	**301,330,171**

NR = none reported.
Source: Toxic Release Inventory (U.S. EPA, 1999a)

A.3 ESTIMATED NUMBER OF ADDITIONAL REPORTS

This section estimates the number of additional TRI reports that may be submitted for lead and lead compounds, assuming the reporting thresholds are lowered. Four lower threshold levels were analyzed: 1 pound; 10 pounds; 100 pounds; and 1,000 pounds. This analysis also assumes the *de minimis* exemption would be eliminated; thus, TRI reporting would be expected from facilities manufacturing, processing, or otherwise using lead and/or lead compounds above the lower threshold levels, regardless of the concentration.

Lead and lead compounds were considered together since facilities can file a combined report if thresholds are exceeded for both the parent metals and compounds of that same metal. This analysis assumes that facilities exceeding lower thresholds for both lead and lead compounds will file a single report.

A.3.1 ANALYTICAL METHODS

To predict the number of reports at each of the lower thresholds, information on the amount of lead manufactured, processed, or otherwise used by each facility in each TRI-subject SIC code is required. Facility-level lead use data, however, were not available for most industries. Therefore, for this analysis, it was necessary to formulate approaches with which the available data could be used to develop best estimates of the number of reports. Due to limitations in industry-specific data, a number of assumptions were made in developing estimates of the number of additional reports. A number of approaches were developed, depending on the type of data available for the industry group. The following methods are described in more detail in the following subsection.

- Lead Production/Consumption Method,
- Lead Concentration Method,
- Air Emission Factor Method,
- Sector Air Emissions Method,
- Facility-specific Data Method,
- Combustion Data Method, and
- Industry Source Method.

For several industries (Refuse systems–SIC 4953, Bulk petroleum–SIC 5171, and Solvent recovery services–SIC 7389), additional methods were used to estimate the number of reports. These approaches are discussed in detail in the specific subsection for each SIC code.

For many of the methods listed above, this analysis used employment size class (i.e., the number of employees) to approximate a distribution of lead use within an industry. Estimating a distribution of lead use helps differentiate between small and large facilities and provides a more accurate estimate than an average amount of lead use per facility across an entire industry. This analysis assumes that lead use was proportional to the cost of materials or value of shipments (for metal mining), two measures of throughput. For most industries, cost of materials and value of shipments data were available by employment size class (U.S. Bureau of the Census, 1992). For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class. To obtain these estimates, it was assumed that all facilities in each industry manufacture, process, or otherwise use lead in their operations.

Lead Production/Consumption Method

This method uses lead production or consumption data from the U.S. Geological Survey (1998a, 1999a) to determine the amount of lead produced or consumed per facility in primary and secondary lead, zinc, and copper smelting and refining; inorganic pigments; brass and bronze; small arms ammunition; and storage battery industries. This method involved the following steps:

- Obtain the number of facilities in each facility size or employment size class;
- Determine the total lead production or consumption for the sector;
- Estimate the amount of lead produced or consumed in each size category, using available production or consumption data;
- Calculate the average lead use per facility in each size category; and
- Determine the number of facilities exceeding the lower reporting thresholds.

Lead Concentration Method

This method uses lead concentration estimates and production data to estimate the amount of lead in the metal mining, coal mining, plating and polishing, gold ores, animal feed, fertilizers, aluminum processing, galvanizing, blast furnace and steel mills, steel wiredrawing and steel nails and spikes, and printed circuit board industries. In addition, the concentration of lead in crude oil was applied to facility-specific throughput data for petroleum refining (see "Facility-specific Data Method" below). The lead concentration method involved the following steps:

- Obtain the number of facilities in each employment size class (i.e., by number of employees);
- Estimate the production throughput of each employment size class, using cost of materials or value of shipments as a proxy for materials throughput;
- Determine the concentration of lead as a trace constituent;
- Estimate the amount of lead for each employment size class by multiplying materials throughput by the lead concentration;
- Calculate the average lead use per facility in each employment size class; and
- Determine the number of facilities exceeding the lower reporting thresholds.

Air Emission Factor Method

This method uses lead and lead compound air emissions as a proxy for minimum lead and lead compound use. Because total lead use exceeds the amount of lead emitted to air (particularly if pollution control devices are used), this method underestimates the total amount of lead used by a facility. For many industries, lead and lead compound air emissions in each employment size class were estimated by multiplying the production throughput of each class by the emission factor for that industry (U.S. EPA, 1998a). This method was applied to the pulp mill, asphalt paving, iron foundry, and primary and secondary metals smelting industries. In addition, a lead air emission factor was applied to facility-specific throughput data for cement manufacturing (see "Facility-specific Data Method" below). However, considerable uncertainty is introduced by applying emission factors to industry throughputs because the emission factors are almost always based on limited data and because there are different technologies used in different facilities in the same industry. The approach involved the following steps:

- Obtain the number of facilities in each employment size class (i.e., by number of employees);
- Estimate the production throughput in each employment size class, using cost of materials as a proxy for production;
- Determine the lead emission factor based on activity;
- Estimate the amount of lead (based on air emissions) for each employment size class, by multiplying throughput by the lead emission factor;
- Calculate the average lead use per facility in each employment size class; and
- Determine the number of facilities exceeding the lower reporting thresholds.

Sector Air Emissions Method

This method also uses lead and lead compound air emissions as a proxy for minimum lead and lead compound use; therefore, the Sector Air Emissions Method also underestimates the total amount of lead used by a facility. Unlike the Air Emission Factor Method, this method uses air emission estimates for an entire industry sector and does not depend on throughput data to determine total lead use. Sector-wide estimates from the National Air Pollutant Emission Trends Update were used to estimate the amount of lead in ferroalloy manufacturers and steel foundries (U.S. EPA, 1998b). This approach involved the following steps:

- Obtain the number of facilities in each employment size class (i.e., by number of employees);
- Estimate the total lead air emissions for the sector;
- Estimate the amount of lead (based on air emissions) for each employment size class, using cost of materials as a proxy for production;
- Calculate the average lead use per facility in each employment size class; and
- Determine the number of facilities exceeding the lower reporting thresholds.

Facility-specific Data Method

Facility-specific production throughput data were available for two sectors: petroleum refining and cement manufacturing. This method used facility-specific data to estimate additional numbers of reports. The concentration of lead in crude oil was applied to crude oil distillation capacity data for petroleum refineries, and a lead air emission factor was applied to clinker production capacity data for cement kilns. The approach involved the following steps:

- Estimate the number of facilities;
- Obtain facility-specific production throughput data;
- Determine the lead emission factor or concentration of lead as a trace contaminant;
- Estimate the activity required to exceed each of the four lower thresholds, by dividing each threshold by the lead air emission factor; and
- Determine the number of facilities exceeding the lower reporting thresholds.

As stated previously, using lead and lead compound air emissions as a proxy for minimum lead and lead compound use (for cement kilns) underestimates the total amount of lead.

Combustion Data Method

Lead is also found in fuels used by manufacturing facilities and electric utilities and may also be created as a byproduct of the combustion process. Because industrial boilers may be found in many manufacturing sectors, manufacturing facilities may have both process and combustion sources of lead. The approach used to estimate the number of Manufacturing facilities (SIC 20-39) and Electric utilities (SIC 4911, 4931, and 4939) that are expected to exceed the lower TRI reporting thresholds for lead as a result of fuel usage included the following steps:

- Determine typical concentrations for lead in the various fuels,
- Calculate the minimum annual throughput of various fuels needed to exceed each of the lower thresholds, and
- Determine the number of facilities exceeding the lower reporting thresholds.

Because manufacturing facilities may have both process-specific and combustion sources of lead, double-counting is addressed by subtracting out the potential overlap of process and combustion sources at the two-digit SIC level.

Industry Source Method

In sectors where sufficient data were not available to apply the other methods, this analysis relied on information from industry sources such as trade associations or individual facilities. This method was applied to the stained glass, motor vehicle, antimony trioxide, plating and polishing, electron tube, semiconductor, capacitor, resistor, coil and transformer, connector, electronic component, and organ manufacturing industries. While the approach varied depending on the type of information provided by the source, it generally involved the following steps:

- Obtain the number of facilities with 10 or more employees from Census data, if available, or from an industry source;
- Based on information from an industry source(s), estimate the amount of lead processed for a facility of a given size;
- Estimate the lead processed in each employment size category; and
- Determine the number of facilities exceeding the lower reporting thresholds.

A.3.2 DETERMINING ADDITIONAL REPORTS FOR EACH INDUSTRY

Industries Not Expected to Submit Additional TRI Reports

One industry group that already reports to TRI under current reporting thresholds is not expected to submit additional TRI reports under the final lead rule: Primary smelting and refining of nonferrous metals (SIC 3331, 3339). All facilities in these SIC codes subject to section 313 reporting are expected to report at the current thresholds.

Primary copper smelters (SIC 3331) and Primary lead and zinc smelters (SIC 3339) are assumed to be processing and/or coincidentally manufacturing lead and lead compounds at levels exceeding current TRI thresholds based on current production levels. Therefore, the final rule is not expected to result in additional reports from facilities in either of these industry groups (see Tables A-5 and A-6). In 1998, nine primary copper smelters and nine primary lead and zinc smelters reported to TRI for lead or lead compounds.

TABLE A-5
SIC 3331: PRIMARY SMELTING AND REFINING OF COPPER

Method 1:			
Number of facilities [a]	Total copper produced [b] (million lbs)	Amount of lead [c] (million lbs)	Average amount of lead per facility (million lbs)
6	4,670	47	8
Method 2:			
Number of facilities [a]	Total copper produced [b] (million lbs)	Amount of lead [d] (million lbs)	Average amount of lead per facility (million lbs)
6	4,670	3	492,944

a. The number of facilities in USGS, 1999d was multiplied by the percent of establishments in SIC 3331 that had 10 or more employees (86.4%) (U.S. Bureau of the Census, 1996b). Note: this estimated number of facilities (6 facilities) is less than the number of facilities in this SIC code that reported to TRI in 1998 for lead and lead compounds (9 facilities).
b. USGS, 1999d. This amount was multiplied by the percent of cost of materials for facilities in SIC 3331 with 10 or more employees (99.0%) (U.S. Bureau of the Census, 1992).
c. Method 1 assumes that the copper concentrate input contains 1% lead ("Input impurities [including lead] are typically found in combined concentrations of less than one percent" [USGS, 1999d]).
d. Method 2 estimates the amount of lead using a combined air emission factor from two process steps, both without control devices (U.S. EPA, 1998a, p. 4-28). Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead. This method also estimates the amount of concentrated copper ore consumed assuming the concentrated ore has 27% copper content and that 100% of the copper is in the product (U.S. EPA, 1998a, p. 4-23).

TABLE A-6
SIC 3339: PRIMARY SMELTING AND REFINING OF NONFERROUS METALS, EXCEPT COPPER AND ALUMINUM

Primary lead smelting:			
Number of facilities [a]	Lead produced [b] (million lbs)	Average amount of lead produced per facility (million lbs)	
2	714	357	
Primary zinc smelting:			
Number of facilities [c]	Zinc produced [d] (million lbs)	Amount of lead (lbs)	Average amount of lead produced per facility (lbs)
2	529	[e]	[e]

a. The number of facilities in USGS, 1999a, was multiplied by the percent of establishments in SIC 3339 that had 10 or more employees (50.8%) (U.S. Bureau of the Census, 1996b). Note: this estimated number of facilities (2 facilities) is less than the number of facilities in this SIC code that reported to TRI in 1998 for lead and lead compounds (9 facilities).
b. USGS, 1999a. This amount was multiplied by the percent of cost of materials for facilities in SIC 3339 with 10 or more employees (98.0%) (U.S. Bureau of the Census, 1992).
c. The number of facilities in USGS, 1999e, was multiplied by the percent of establishments in SIC 3339 that had 10 or more employees (50.8%) (U.S. Bureau of the Census, 1996b).
d. USGS, 1999e. This amount was multiplied by the percent of cost of materials for facilities in SIC 3339 with 10 or more employees (98.0%) (U.S. Bureau of the Census, 1992).
e. The amount of lead in concentrated zinc ore and the amount of zinc produced per pound of zinc ore is needed to

Industries Expected to Submit Additional Reports

SIC 1021 and 1031: Copper, lead, and zinc ore mining

Many copper ore mining (SIC 1021) and lead and zinc ore mining (SIC 1031) facilities are processing lead and lead compounds at levels exceeding current TRI thresholds, based on 1998 reporting. In 1998, 12 copper ore mining facilities and 15 lead and zinc ore mining facilities reported on lead or lead compounds at current thresholds. As shown in Tables A-7 and A-8, it is estimated that an additional 22 copper ore facilities will report at each of the lower reporting thresholds, and an additional 8 lead and zinc ore facilities will report at each of the lower reporting thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of reports from SIC codes 1021 and 1031 would not be affected because the concentration of lead in copper, lead, and zinc ores is above the current *de minimis* level (U.S. EPA, 1998a).

TABLE A-7
SIC 1021: COPPER ORES

Facility size by number of employees [a]	Number of facilities [b]	Value of shipments [c] (million $)	Estimated percent of industry activity	Amount of ore produced annually [d] (million lbs)	Lead concen-tration [e] (lb Pb/lb ore)	Amount of lead (million lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	18	1.8	0.1%	2	0.011	0.0	1,330
10 to 249	18	318.1	9.4%	385	0.011	4.2	235,015
250 to 499	6	416.3	12.3%	503	0.011	5.5	922,699
500 to 999	7	1,470.9	43.6%	1,778	0.011	19.6	2,794,409
1,000 to 2,499	3	1,167.7	34.6%	1,412	0.011	15.5	5,176,245
Total	52	3,374.8	100.0%	4,080		44.9	

a. Some employee categories were combined because of combined cost of supplies data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1999a. It was assumed that production was proportional to the cost of supplies for each facility size class.
e. U.S. EPA, 1998a, p. 4-62. The lead content percentages for copper, copper-lead, copper-zinc, and copper-lead-zinc ore were averaged.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

TABLE A-8
SIC 1031: LEAD AND ZINC ORES

Facility size [a]	Number of facilities [b]	Value of shipments [c] (million $)	Estimated percent of industry activity	Amount of ore produced annually [d] (million lbs)	Lead concentration [e] (lb Pb/lb ore)	Amount of lead (million lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	11	1.4	0.3%	7	0.024	0.2	15,859
10 to 49	8	52.4	11.1%	272	0.024	6.5	816,147
50 to 499	15	418.1	88.6%	2,171	0.024	52.1	3,473,092
Total	34	471.9	100.0%	2,450		58.8	

a. Some employee categories were combined because of combined cost of supplies data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1999a; the amount of lead and zinc ore produced was summed together.
e. U.S. EPA, 1998a, p. 4-62. The lead content percentages for lead, zinc, and lead-zinc ore were averaged.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 1041: Gold ores

Most gold ore deposits contain trace levels of lead, although certain ores do not (U.S. Geological Survey, 1995).

The Lead Concentration Method was used to estimate the number of additional reports expected from this industry at each of the lower reporting thresholds. The concentration of lead in gold ore varies depending on the type of ore deposit being mined (U.S. Geological Survey, 2000a). Therefore, this analysis estimates the concentration of lead in gold ore at which all facilities would be required to report at the 1,000 pound threshold, based on the gold industry's ore usage in 1997. This concentration was estimated to be approximately 7 ppm. Based on the lead concentrations in other mined ores, 7 ppm appears to be a conservative estimate. For example, lead concentration in copper ore is estimated to be 11,000 ppm.

The amount of gold ore handled, 289,904,900 tons in 1997 (Moore, 1997), was multiplied by the assumed concentration of 7 ppm lead in gold ore. Lead use among employment size classes was assumed to be proportional to the cost of materials among employment size classes. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in the size class (see Table A-9). In 1998, 11 facilities in SIC code 1041 reported to TRI for lead or lead compounds. Assuming a lead concentration of 7 ppm, all facilities with 10 or more employees are estimated to process more than 1,000 pounds of lead, resulting in an additional 97 reports expected for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound reporting thresholds.

If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from SIC code 1041 would be reduced because the concentration of lead in gold ore is estimated to be less than the current *de minimis* level. However, since 11 facilities currently report to TRI for lead and lead compounds in SIC 1041, some additional reporting is likely.

TABLE A-9
SIC 1041: GOLD ORES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	182	30.3	0.7%	26,787	147
5 to 9	45	23.6	0.5%	19,134	425
10 to 19	34	41.1	0.9%	34,441	1,013
20 to 49	21	144.9	3.3%	126,283	6,013
50 to 99	14	257.6	5.9%	225,778	16,127
100 to 249	22	1,168.4	26.9%	1,029,394	46,791
250 to 999	15	1,632.2	37.6%	1,438,856	95,924
1,000 +	2	1,041.9	24.0%	918,419	459,209
Total	335	4,340.0	100%		

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992. Cost of materials was assumed to be proportional to the number of facilities within each facility size class.
d. Crude gold ore handled (289,904,900 tons; USGS, 1997) was multiplied by the assumed concentration of lead in gold ore (0.00066%) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size class. This analysis assumes no beneficiation of waste rock, therefore, it is not counted towards threshold determinations (U.S. EPA, 1999g).
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in the class.

SIC 12: Coal mining

Coal mining industry facilities, except Coal mining services (SIC 1241) and all coal extraction activities, may be required to report for lead, which is a trace constituent in coal. The Lead Concentration Method was used to estimate the number of lead reports from the coal mining sector. To limit the analysis only to facilities with ten or more employees, the amount of coal produced was multiplied by the percent of value of shipments for facilities in SIC 122 and 123 (TRI-subject subgroups within SIC 12) with ten or more employees (96.6%) (U.S. Bureau of the Census, 1992). The total amount of lead was estimated by multiplying the adjusted coal production by a typical concentration of lead in coal (111 parts per million [ppm] by weight) (U.S. EPA, 1997a). The amount of lead per facility was calculated by dividing the total amount of lead by the number of facilities with ten or more employees (321) (U.S. EPA, 1997a) (see Table A-10).

In 1998, seven coal mining facilities reported for lead and lead compounds at current thresholds. An additional 314 facilities in SIC 12 are estimated to submit TRI reports for lead and lead compounds at each of the four lower thresholds (1, 10, 100, and 1,000 lbs). If the current *de minimis* exemption for lead and lead compounds were retained, no additional reports would be expected because the concentration of lead in coal is below the current *de minimis* level.

TABLE A-10
SIC 12: COAL MINING

Number of facilities with 10 or more employees [a]	Amount of coal produced [b] (million lbs)	Lead concentration [c] (lbs Pb/ million lbs)	Amount of lead (million lbs)	Average amount of lead per facility (lbs)
321	199,570	111	22.2	69,010

a. U.S. EPA, 1997a. This number excludes coal extraction and mining services facilities, but includes co-located mines and preparation plants.
b. U.S. Department of Energy, 1995. This amount was multiplied by the percent of value of shipments for facilities in SIC 122 and 123 with 10 or more employees (96.6%) (U.S. Bureau of the Census, 1992).
c. U.S. EPA, 1997a.

SIC 2047 and 2048: Animal feed

The animal feed industry manufactures prepared feeds for pets, livestock, and poultry. Included in this industry's products are dog and cat food, poultry and livestock feed, and formulated feed ingredients. During the formulation and manufacturing of animal feed, certain additives are added to satisfy animal nutrient requirements. Some of the mineral additives contain trace amounts of lead as a naturally occurring impurity. In particular, lead is found in six minerals commonly added to animal feed:

- Zinc oxide with lead concentrations of 100 - 500 ppm,
- Copper oxide with lead concentrations of 10 - 100 ppm,
- Manganese oxide with lead concentrations of 10 - 100 ppm,
- Manganese sulfate with lead concentrations of 10 - 100 ppm,
- Copper sulfate with lead concentrations of 10 - 50 ppm, and
- Dicalcium phosphate with lead concentrations of 1 - 10 ppm.

The Lead Concentration Method was used to estimate the number of reports expected from the animal feed industry due to lead processing. This sector is defined by two SIC codes: 2047, Dog and cat food, and 2048, Prepared feeds, n.e.c. Based on information from an industry source, the average concentration of lead in feed is 0.0075 lb lead/ton feed (Purina, 1999). There are 1,110 facilities with 10 or more employees in these two SIC codes (U.S. Bureau of the Census, 1996b). Based on the total feed production values for the industry, it is estimated that all 1,110 animal feed facilities with 10 or more employees would exceed the 1- and 10-pound thresholds (see Tables A-11 and A-12) (Feedstuffs, 1999). At the 100-pound threshold, an estimated 185 facilities would report, and at the 1,000-pound threshold no facilities are estimated to report. None of the facilities in these SIC codes reported to TRI for lead or lead compounds in 1998.

This analysis may overestimate the number of facilities reporting, since some facilities included in SIC 2048 may manufacture feed ingredients that do not contain lead (e.g., facilities that slaughter animals for animal feed). Additionally, the concentration of lead in feed may vary significantly among facilities.

If the current *de minimis* exemption for lead and lead compounds were retained, no reports from the animal feed industry would be expected because the concentration of lead in animal feed additives is below the current *de minimis* level.

TABLE A-11
SIC 2047: DOG AND CAT FOOD

Facility size by number of employees	Number of facilities [a]	Cost of materials (million $) [b]	Estimated percent of industry activity	Average feed production per facility (tons) [c]	Average lead per facility (lbs) [d]
1 - 4	29	6.5	0.2%	1,793	1
5 - 9	16	9.0	0.3%	4,875	4
10 - 19	21	35.4	1.1%	13,620	10
20 - 49	40	213.4	6.5%	42,253	32
50 - 99	23	359.9	10.9%	123,226	92
100 - 249	32	1,151.8	34.9%	283,582	213
250 - 499	13	1,115.6	33.9%	678,047	509
500 - 999	3	404.0	12.3%	1,066,074	800
Total	177	3,295.6	100%		

a. U.S. Bureau of Census, 1996b.
b. U.S. Bureau of Census, 1992.
c. Feedstuffs, 1999. Total feed production, 1996 = 116.6 million tons.
d. U.S. EPA, 1999d. AFIA, 2000. The commenter estimated 3,000 lbs of lead were used for 4 million tons of feed, or 0.00075 lbs/ton. Based on conversations with the commenter and with the AFIA, this level of lead use was assumed to be typical for the industry.

TABLE A-12
SIC 2048: PREPARED FEEDS, N.E.C.

Facility size by number of employees	Number of facilities [a]	Cost of materials (million $) [b]	Estimated percent of industry activity	Average feed production per facility (tons) [c]	Average lead per facility (lbs) [d]
1 - 4	316	222.2	1.9%	5,447	4
5 - 9	285	701.1	6.1%	19,391	15
10 - 19	394	2,143.0	18.7%	43,000	32
20 - 49	447	4,811.0	41.9%	84,923	64
50 - 99	106	2,232.6	19.4%	165,812	124
100 - 249	29	1,074.1	9.4%	293,663	220
250 - 999	2	303.7	2.6%	1,177,777	883
Total	1,579	11,487.7	100%		

a. U.S. Bureau of Census, 1996b.
b. U.S. Bureau of Census, 1992.
c. Feedstuffs, 1999. Total feed production, 1996 = 116.6 million tons.
d. U.S. EPA, 1999d. AFIA, 2000. The commenter estimated 3,000 lbs of lead were present in 4 million tons of feed, or 0.00075 lbs/ton. Based on conversations with the commenter and with the AFIA, this level of lead use was assumed to be typical for the industry.

SIC 2611: Pulp mills

Pulp mills have several potential sources of lead and lead compound emissions. Chemical-recovery furnaces (kraft and sulfite) emit lead as a result of contaminants in process chemicals and trace amounts in wood. Another potential source of lead in pulp mills are smelt-dissolving tanks, which may release lead found in the process chemicals. Smelt (molten inorganic process chemicals) from the recovery furnace is treated in a dissolving tank to recover Na_2S and NaOH. Lime kilns are a third potential source of lead within a pulp mill. A lime kiln is a process heater used to convert lime mud ($CaCO_3$) to burnt lime (CaO), which is used in the recovery of Na_2S and NaOH. Lime kilns may release lead found as a contaminant in lime muds and calcium salts (U.S. EPA, 1998a).

The Air Emission Factor Method was used to estimate the number of lead reports for SIC 2611. For kraft recovery furnaces and smelt-dissolving tanks, black liquor consumption was assumed to be proportional to the cost of materials for each employment size class (U.S. EPA, 1997b; U.S. Bureau of the Census, 1992). Lead and lead compound emissions from sulfite recovery furnaces were not estimated due to lack of data on red liquor solids consumption. For lime kilns, activity was measured by the amount of dry pulp produced and was also assumed to be proportional to the cost of materials for each employment size class.

The total amount of lead for each employment size class was estimated by multiplying the activity levels for kraft recovery furnaces and lime kilns by their respective emission factors. The emission factor for smelt-dissolving tanks was incorporated into the kraft recovery furnace emission factor because both emission factors share the same activity basis (i.e., amount of black liquor consumed). The emission factor for nondirect contact kraft recovery furnaces and smelt-dissolving tanks (both with pollution control devices) was 0.0715 pounds of lead per million pounds of black liquor consumed (U.S. EPA, 1998a). Because of a lack of facility-specific process data, it was assumed that all pulp mills have kraft recovery boilers, smelt-dissolving tanks, and lime kilns. The estimated amounts of lead from each process step were summed together. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table 13).

In 1998, one pulp mill reported to TRI for lead or lead compounds. At the 1- or 10-pound thresholds, an additional 47 pulp mills are estimated to submit TRI reports for lead and lead compounds. An additional 28 pulp mills are estimated to report lead at the 100-pound threshold, while no pulp mills are expected to report for lead at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from pulp mills may be reduced because the concentration of lead in process chemicals, lime mud, wood, and fossil fuel may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-13
SIC 2611: PULP MILLS
(Kraft black liquor recovery boilers)

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Black liquor consumed [d] (million lbs)	Amount of lead [e] (lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	14	[c]	[c]	[c]	[c]	[c]
10 to 49	15	40.3	1.4%	2,427	174	12
50 to 99	4	47.4	1.6%	2,855	204	51
100 to 249	7	348.6	11.8%	20,995	1,501	214
250 to 499	9	848.6	28.7%	51,108	3,654	406
500 to 2,499	13	1,672.8	56.6%	100,746	7,203	554
Total	62	2,957.7	100.0%	178,130	12,736	

TABLE A-13, CONT'D.
SIC 2611: PULP MILLS
(Lime kilns)

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Pulp produced (dry basis) [g] (million lbs)	Amount of lead [h] (lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	14	[c]	[c]	[c]	[c]	[c]
10 to 49	15	40.3	1.4%	1,793	98	7
50 to 99	4	47.4	1.6%	2,109	115	29
100 to 249	7	348.6	11.8%	15,514	845	121
250 to 499	9	848.6	28.7%	37,765	2,058	229
500 to 2,499	13	1,672.8	56.6%	74,444	4,057	312
Total	62	2,957.7	100.0%	131,626	7,174	

SIC 2611: PULP MILLS
(Total)

Facility size by number of employees [a]	Number of facilities [b]	Average amount of lead per facility [i] (lbs)
1 to 9	14	[c]
10 to 49	15	18
50 to 99	4	80
100 to 249	7	335
250 to 499	9	635
500 to 2,499	13	866
Total	62	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992. While U.S. Bureau of the Census, 1996b, presents 14 establishments for facilities with less than 10 employees, the U.S. Bureau of the Census, 1992, presents no establishments with less than 10 employees; therefore, there is no cost of materials data available for this facility size category.
d. U.S. EPA, 1998g, p. 5-23. It was assumed that consumption was proportional to the cost of materials for each facility size class.
e. The amount of lead was estimated using an air emission factor of 0.0715 lb Pb/MMlb of black liquor consumed; this is sum of two emission factors for nondirect contact recovery furnaces and smelt dissolving tank, both with control devices. U.S. EPA, 1998a, p. 5-109. Because total lead use is greater than lead emitted to air (especially after controls), this method underestimates the amount of total lead.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.
g. U.S. Bureau of the Census, 1992. It was assumed that production was proportional to the cost of materials for each facility size class.
h. The amount of lead was estimated using an air emission factor of 0.0545 lb Pb/MMlb of pulp produced (dry basis) without any control device, U.S. EPA, 1998a, p. 5-112. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
i. The average amount of lead per facility is the sum of the average amounts due to black liquor recovery boilers and lime kilns in pulp mills.

SIC 2816: Inorganic pigments

Lead oxide is used as a pigment in paints and ceramic glazes. The main lead oxides are litharge (lead monoxide–PbO), lead dioxide (PbO_2), and red lead (lead tetroxide–Pb_3O_4). Other lead pigments include basic lead carbonate ($2PbCO_3{\cdot}Pb(OH)_2$), lead chromate ($PbCrO_4$), basic lead silicate ($PbO{\cdot}SiO_2$), basic lead sulfate ($PbO{\cdot}PbSO_4$), and leaded zinc oxides. Most of these compounds are derived from litharge, which is consequently reacted with oxygen, acetic acid, sodium chromate, or other compounds to make the respective pigments (U.S. EPA, 1998a; *Hawley's*, 1997; *Ullman's*, 1990). Lead pigments are used because of their rich color quality, excellent opacity, durability, chemical stability, low costs, hiding power, heat resistance, and/or corrosion resistance (U.S. EPA, 1991).

The Lead Production/Consumption Method was used to estimate the number of lead reports for SIC 2816. Production data was gathered to estimate the total amount of lead in this SIC code. It was assumed that lead oxides and pigments comprise one percent of zinc oxide and other white opaque pigments as measured by pounds of product shipped (U.S. Bureau of the Census, 1992). The average amount of lead per facility was estimated by dividing the total estimated amount of lead oxides and pigments (approximately 8 million pounds) by the 25 facilities with more than 10 employees (see Table A-14).

In 1998, 16 inorganic pigment facilities reported to TRI for lead or lead compounds. An additional nine facilities in SIC 2816 are estimated to submit TRI reports for lead and lead compounds at each of the four lower reporting thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from inorganic pigment facilities would not be affected because the concentration of lead exceeds the current *de minimis* level.

TABLE A-14
SIC 2816: INORGANIC PIGMENTS

Number of facilities [a]	Amount of lead oxide/pigment produced [b] (lbs)	Average amount of lead per facility (lbs)
25	8,040,000	321,600

a. The number of facilities in U.S. EPA, 1998a (pp. 6-18,19) was multiplied by the percent of establishments in SIC 2816 that had 10 or more employees (72.3%) (U.S. Bureau of the Census, 1996b).
b. It was assumed that lead compounds account for 1% of the quantity of product shipments from U.S. Bureau of the Census, 1992, for zinc oxide and other white opaque pigments. This amount was multiplied by the percent of cost of materials for facilities in SIC 2816 with 10 or more employees (98.8%) (U.S. Bureau of the Census, 1992).
c. The amount of lead per facility was estimated by dividing the total amount of lead oxide/pigment produced by the number of facilities with 10 or more employees in SIC 2816.

SIC 2821, 3229, 3261: Lead reports due to antimony trioxide

Antimony trioxide (ATO) is used as a flame retardant synergist and is also used in the production of glass, ceramics, catalysts, and pigments (Mannsville Chemical Products Corporation, 1997). ATO contains an average of 0.12% lead antimonate as an impurity (Great Lakes Chemical Corporation, 1999). Manufacturing activities that use ATO are classified in several SIC codes, including SIC 2821 (Plastics materials, synthetic resins, and nonvulcanizable elastomers), SIC 3229 (Pressed and blown glassware, n.e.c.), and SIC 3261 (Vitreous plumbing fixtures).

The Industry Source Method was used to estimate the number of lead reports expected from SIC codes 2821, 3229, and 3261 due to lead processing. Information gathered from an industry source was used to estimate the number of facilities reporting at the 1-, 10-, 100-, and 1,000-pound thresholds for each of these SIC codes. Industry data was provided for ceramics applications in general, however, it was not available for specific types of ceramics applications. This analysis assumes that the number of additional reports due to lead processing in ceramics applications is divided evenly between SIC codes 3229 and 3261.

Because market share data was not available, the number of facilities estimated to report, other than those known to the industry source, was not analyzed. Consequently, underestimation of additional reports may occur because facilities other than those analyzed may use quantities of ATO that would exceed the reporting thresholds. Underestimation may also occur because the use of ATO in applications other than flame retardants and ceramics was not analyzed. For example, 10% of overall ATO use is in the production of catalysts and pigments, however, sufficient data was not available on quantities used in these applications to estimate the number of facilities expected to report (Mannsville Chemical Products Corporation, 1997).

If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports due to ATO would not be affected because the average concentration of lead in ATO exceeds the current *de minimis* level.

Plastics materials, synthetic resins, and nonvulcanizable elastomers (SIC 2821)

In 1998, six facilities in this SIC code reported to TRI for lead or lead compounds. It is assumed that none of these reports resulted from lead in ATO. An industry source estimated that 280 facilities would report at the 1- and 10-pound thresholds due to lead in ATO. The industry source also estimated that 125 facilities would report at the 100-pound threshold due to lead in ATO, and seven facilities would report at the 1,000-pound threshold due to lead in ATO (Great Lakes Chemical Corporation, 2000).

Pressed and blown glassware, n.e.c. (SIC 3229)

In 1998, 21 facilities in this SIC code reported to TRI for lead or lead compounds. It is assumed that none of these reports resulted from lead in ATO. An industry source estimated that 25 facilities would report at the 1- and 10-pound thresholds due to lead in ATO. The industry source also estimated that five facilities would report at the 100-pound threshold due to lead in ATO, and one facility would report at the 1,000-pound threshold due to lead in ATO (Great Lakes Chemical Corporation, 2000).

Vitreous plumbing fixtures (SIC 3261)

In 1998, no facilities in this SIC code reported to TRI for lead or lead compounds. An industry source estimated that 25 facilities would report at the 1- and 10-pound thresholds due to lead in ATO. The industry source also estimated that six facilities would report at the 100-pound threshold due to lead in ATO, and one facility would report at the 1,000-pound threshold due to lead in ATO (Great Lakes Chemical Corp., 2000).

Parts of SIC 2873, 2874, 2875, and 28197: Fertilizer manufacturers

Fertilizer production and manufacture involves the use of ingredients that contain trace amounts of lead and lead compounds. Fertilizer manufacturers are classified in SIC codes 2873 (Nitrogenous fertilizers), 2874 (Phosphatic fertilizers), 2875 (Mixed fertilizers), and 28197 (Inorganic potassium and sodium compounds, n.e.c.).

The Lead Concentration Method was used to estimate the number of additional reports expected from each type of fertilizer facility due to lead processing. This analysis assumes that the number of employees per fertilizer facility in each 5-digit SIC code follows the same distribution as the corresponding 4-digit SIC code. The amount of fertilizer produced by each sector was obtained from an EPA study (U.S. EPA, 1999e) and was assumed to be proportional to the cost of materials for each employment size class. The total amount of lead per size category was estimated by multiplying each type of fertilizer production by the average concentration of lead in each type of fertilizer. The amount of lead per facility was calculated by dividing the total amount of lead per size category by the number of facilities within that size category (see Tables A-15, A-16, A-17, A-18, and A-19).

Although several fertilizer manufacturing facilities filed TRI reports for lead or lead compounds in 1998, the concentration of lead in nitrogenous, organic, phosphatic, and mixed fertilizer types is estimated to be below the current *de minimis* value. Thus, facilities may exceed current TRI reporting thresholds for lead, but might not report because of the *de minimis* exemption. Therefore, if the current *de minimis* exemption for lead and lead compounds were retained, no additional reports from these types of fertilizer manufacturers would be expected because the concentration of lead is below the current *de minimis* level. The concentration of lead in micronutrient fertilizers, however, often exceeds the current *de minimis* level. In such cases, the retention of the current *de minimis* exemption for lead and lead compounds would not affect the number of additional reports.

Nitrogenous fertilizers (SIC 2873)

SIC code 2873 includes nitrogenous as well as organic fertilizer manufacturers. Nitrogenous fertilizer manufacturers are classified in SIC codes 28730, 28731, and 28732, while organic fertilizer manufacturers are classified in SIC code 28733. Nitrogenous fertilizers are composed of ammonium salts and other nitrogen-containing chemicals, and often contain trace amounts of lead. Lead in organic fertilizers often comes from municipal solid waste. The average concentration of lead in nitrogenous fertilizers was estimated to be 127.9 ppm, while the average concentration of lead in organic fertilizers was estimated to be 74.0 ppm (U.S. EPA, 1999e). Nitrogenous fertilizer production was estimated to be 46.8 billion pounds per year, and annual organic fertilizer production was estimated to be 1.14 billion pounds per year (U.S. EPA, 1999e). Nitrogenous and organic fertilizer facilities were analyzed separately.

In 1998, one facility in SIC code 2873 reported to TRI for lead or lead compounds. This facility was assumed to be a nitrogenous fertilizer manufacturer rather than an organic fertilizer manufacturer. Seventy additional nitrogenous fertilizer facilities are estimated to report at the 1-, 10-, 100-, and 1,000-pound thresholds. Nineteen organic fertilizer facilities are estimated to report at the 1-, 10-, and 100-pound thresholds, and 14 facilities are estimated to report at the 1,000-pound threshold.

TABLE A-15
SIC 28730, 28731 and 28732: NITROGENOUS FERTILIZERS

Facility size by number of employees	Percent of facilities by size category in SIC 2873 [a]	Number of facilities in SIC 28730,1,2 [b]	Cost of materials for SIC 2873 (million $) [c]	Estimated percent of industry activity	Amount of lead (lbs) [d]	Average lead per facility (lbs) [e]
1 to 9	41%	49	37.9	2.0%	119,778	2,444
10 to 19	15%	18	20.2	1.1%	65,878	3,660
20 to 49	19%	23	281.8	15.1%	904,326	39,319
50 to 99	11%	14	340.7	18.2%	1,089,982	77,856
100 to 249	13%	16	1,191.0	63.6%	3,808,947	238,059
Total	100%	120	1,871.6	100%	5,988,911	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. Total number of nitrogenous fertilizer facilities by size group was determined assuming the number of employees in SIC codes 28730, 28731, and 28732 followed a distribution similar to that for SIC 2873.
c. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's lead use.
d. U.S. EPA, 1999e. Nitrogenous fertilizer production (46,824,950,000 lbs) was multiplied by the average concentration of lead in nitrogenous fertilizers to determine the total amount of lead per size category.
e. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

TABLE A-16
SIC 28733: ORGANIC FERTILIZERS

Facility size by number of employees	Percent of facilities by size category in SIC 2873 [a]	Number of facilities in SIC 28733 [b]	Cost of materials for SIC 2873 (million $) [c]	Estimated percent of industry activity	Amount of lead (lbs) [d]	Average lead per facility (lbs) [e]
1 to 9	41%	13	37.9	2.0%	1,692	130
10 to 19	15%	5	20.2	1.1%	931	186
20 to 49	19%	6	281.8	15.1%	12,774	2,129
50 to 99	11%	4	340.7	18.2%	15,396	3,849
100 to 249	13%	4	1,191.0	63.6%	53,801	13,450
Total	100%	32	1,871.6	100%	84,594	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. Total number of organic fertilizer facilities by size group was determined assuming the number of employees in SIC codes 28733 followed a distribution similar to that for SIC 2873.
c. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's lead use.
d. U.S. EPA, 1999e. Organic fertilizer production (1,143,150,000 lbs) was multiplied by the average concentration of lead in organic fertilizers to determine the total amount of lead per size category.
e. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

Phosphatic fertilizers (SIC 2874)

Phosphatic fertilizers are made from phosphate rock deposits, which contain trace amounts of several heavy metals, including lead. The average lead concentration in phosphatic fertilizers was estimated to be 61.7 ppm, and phosphatic fertilizer production was estimated to be 14.4 billion pounds per year (U.S. EPA, 1999e).

In 1998, one facility in this SIC code reported to TRI for lead or lead compounds. An additional 47 facilities are estimated to report at the 1-, 10-, and 100-pound thresholds. An additional 33 phosphatic fertilizer facilities are estimated to report at the 1,000-pound threshold.

TABLE A-17
SIC 2874: PHOSPHATIC FERTILIZERS

Facility size by number of employees	Number of facilities [a]	Cost of materials (million $) [b]	Estimated percent of industry activity	Amount of lead (lbs) [c]	Average lead per facility (lbs) [d]
1 to 9	24	26.4	0.9%	8,001	333
10 to 19	14	11.4	0.4%	3,556	254
20 to 49	10	522.5	17.0%	151,127	15,113
50 to 249	12	511.4	16.6%	147,571	12,298
250 to 499	9	798.1	25.9%	230,246	25,583
500 to 999	3	1,206.6	39.2%	348,480	116,160
Total	72	3,076.4	100%	888,981	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's lead use.
c. U.S. EPA, 1999e. Phosphatic fertilizer production (14,408,108,000 lbs) was multiplied by the average concentration of lead in phosphatic fertilizers to determine the amount of lead per size category.
D. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

Mixed fertilizer (SIC 2875)

Mixed fertilizer manufacturers combine two or more fertilizer materials. They often combine nitrogenous, phosphatic, potash, and multiple nutrient fertilizers. These fertilizer types contain various amounts of lead, as described throughout the report. Because mixed fertilizers are largely composed of fertilizer materials from SIC codes 2873 and 2874, this analysis assumes that the average lead concentration in mixed fertilizer can not be less than the lowest average concentration for these SIC codes. The average lead concentration in phosphatic fertilizers, 61.7 ppm, was used as a proxy for the concentration of lead in mixed fertilizers. Mixed fertilizer production was estimated to be 38 billion pounds per year (U.S. EPA, 1999e).

In 1998, two facilities in this SIC code reported to TRI for lead or lead compounds. An additional 192 facilities are estimated to report at the 1-, 10-, 100-, and 1,000-pound thresholds.

TABLE A-18
SIC 2875: MIXED FERTILIZERS

Facility size by number of employees	Number of facilities [a]	Cost of materials (million $) [b]	Estimated percent of industry activity	Amount of lead (lbs) [c]	Average lead per facility (lbs) [d]
1 to 9	229	193.8	12.4%	291,491	1,273
10 to 19	87	338.4	21.7%	510,109	5,863
20 to 49	77	405.1	25.9%	608,840	7,907
50 to 99	21	242.1	15.5%	364,364	17,351
100 to 249	7	383.3	24.5%	575,930	82,276
250 to 499	1	NA	NA	NA	NA
500 to 999	1	NA	NA	NA	NA
Total	423	1,562.7	100%	2,350,734	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's lead use.
c. U.S. EPA, 1999e. Mixed fertilizer production (38,099,414,000 lbs) was multiplied by the average concentration of lead in phosphatic fertilizers to determine the amount of lead per size category.
d. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

Inorganic potassium and sodium compounds, n.e.c. (SIC 28197)

Many micronutrient fertilizer producers are classified in SIC code 28197. Several types of industrial wastes, such as K061 (electric arc furnace dust) and brass foundry dust, may be recycled into micronutrient fertilizers and contain relatively high concentrations of lead. The average lead concentration in micronutrient fertilizers was estimated to be 4,008.1 ppm, and annual micronutrient fertilizer production was estimated to be 108 million pounds (U.S. EPA, 1999e).

In 1998, 27 facilities in SIC code 2819 reported to TRI for lead or lead compounds. To estimate the number of reports from SIC code 28197, the percent of facilities in SIC code 2819 that are micronutrient fertilizer manufacturers (SIC code 28197) was applied to the 27 current reports. Thus, two of the 27 reports are assumed to be attributed to SIC code 28197. Thirty-five additional micronutrient fertilizer facilities are estimated to report at the 1-, 10-, 100-, and 1,000-pound thresholds.

This analysis may underestimate the number of reports for micronutrient fertilizers because SIC code 28197 may not capture all micronutrient fertilizer manufacturers. At the same time, this analysis may also overestimate the number of reports of micronutrient fertilizer manufacturers because all the facilities classified in SIC code 28197 may not necessarily be micronutrient fertilizer manufacturers.

TABLE A-19
SIC 28197: INDUSTRIAL POTASSIUM AND SODIUM COMPOUNDS N.E.C.

Facility size by number of employees	Percent of facilities by size category in SIC 2819 [a]	Number of facilities in SIC 28197 [b]	Cost of materials for SIC 2819 (million $) [c]	Estimated percent of industry activity	Amount of lead (lbs) [d]	Average lead per facility (lbs) [e]
1 to 9	39%	24	184.9	2.7%	11,688	487
10 to 19	12%	8	152.3	2.2%	9,523	1,190
20 to 49	20%	12	689.8	9.9%	42,855	3,571
50 to 99	12%	7	1,097.0	15.8%	68,394	9,771
100 to 249	9%	6	1,920.1	27.6%	119,473	19,912
250 to 499	4%	2	604.1	8.7%	37,660	18,830
500 to 999	2%	1	1,259.5	18.1%	78,350	78,350
1000 - 2499	1%	1	1,055.4	15.2%	65,797	65,797
Total	100%	61	6,963.1	100%	433,740	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. Total number of facilities in SIC 28197 by size group was determined assuming employees per SIC 28197 followed a distribution similar to that for SIC 2819.
c. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's lead use.
d. U.S. EPA, 1999e. Micronutrient fertilizer production (108,000,000 lbs) was multiplied by the average concentration of lead in micronutrient fertilizers to determine the amount of lead per size category.
e. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

SIC 2911: Petroleum refining

Lead is a trace constituent in the crude oil processed by petroleum refineries. Lead and lead compounds may also be found in catalytic cracking units, corrosion inhibitors, and gel stabilizers for well plugging (U.S. EPA, 1998d; *Hawley's*, 1997; *Kirk-Othmer*, 1998).

A combination of the Facility-specific Data Method and the Lead Concentration Method was used to estimate the number of lead reports for SIC 2911. Facility-specific crude oil distillation capacity data for 174 of the 179 petroleum refineries in the United States were obtained (U.S. EPA, 1999b). The number of facilities with crude oil capacity data was multiplied by the percent of establishments in SIC 2911 that had 10 or more employees (73%), yielding 127 facilities (U.S. Bureau of the Census, 1996b). It was assumed that these 127 facilities had the largest crude oil capacities of the 174 facilities with known capacities, because facilities with a larger number of employees generally have greater production capacities than facilities with a smaller number of employees.

A typical concentration of lead in crude oil is estimated to be 0.31 ppm (Valkovic, 1978).[2] Each of the four lower thresholds was divided by the lead concentration in crude oil to obtain the required throughput to exceed each threshold. The required throughput numbers were then compared to the list of facility-specific capacity data to estimate the number of facilities filing additional TRI reports at the lower reporting thresholds. Because capacity data are used instead of operating throughput data, this analysis may slightly overestimate the amount of lead per facility (see Table A-20).

In 1998, 32 petroleum refining facilities reported to TRI for lead or lead compounds. An additional 95 facilities in SIC 2911 are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, and 100-pound thresholds; and an additional 94 facilities are estimated to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, no additional reports would be expected because the concentration of lead in crude oil is below the current *de minimis* level. However, petroleum refineries may need to report lead from sources other than crude oil.

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[2]This analysis assumes that the ppm units in Valkovic (1978) are based on weight, not volume.

TABLE A-20
SIC 2911: PETROLEUM REFINING

Lead threshold	Crude oil distillation capacity required per facility [a] (million lbs)	Number of facilities with 10 or more employees [b]	Total crude oil capacity [c] (million lbs)	Estimated total lead [d] (lbs)
Greater than 1 lb	3.2	127		
Greater than 10 lbs	32.3	127		
Greater than 100 lbs	323	127		
Greater than 1,000 lbs	3,226	126		
Greater than 10,000 lbs	32,258	12		
Greater than 25,000 lbs	80,645	0		
Total			1,963,232	608,602

a. The required crude oil distillation capacity was estimated using an estimate for lead in crude oil (0.31 ppm [weight basis assumed]; Valkovic, 1978).
b. U.S. EPA, 1999b. Facility-specific crude oil capacity data for 174 of 179 refineries were obtained from the Sector Facility Indexing Project web site (www.epa.gov/oeca/sfi) based on 1995 data from the National Petroleum Refiners Association and 1996 data from industry (Abt Associates, 2000). The number of facilities with crude oil capacity data was multiplied by the percent of establishments in SIC 2911 that had 10 or more employees (73.5%) (U.S. Bureau of the Census, 1996b) to yield 127 facilities; it was assumed that these facilities had the largest crude oil capacities.
c. This total represents the 127 facilities with the largest crude oil capacities.
d. The estimated concentration of lead in crude oil (0.31 ppm [weight basis assumed]; Valkovic, 1978) was applied to the total crude oil capacity for the 127 facilities with the largest capacities.

SIC 2951: Asphalt paving mixtures and blocks

Emissions of lead and lead compounds from hot-mix asphalt plants may result from aggregate mixing, rotary drying, and asphalt heating. In these processes, lead may be found in asphalt as a trace constituent in the raw material feed or fuel, or it may be released as a result of the practice of burning hazardous waste as a supplemental fuel in the asphalt manufacturing process (U.S. EPA, 1998a).

The Air Emission Factor Method was used to estimate the number of lead reports for SIC 2951. The amount of hot-mix asphalt produced by the industry was assumed to be proportional to the cost of materials for each employment size class (NAPA, 1999; U.S. Bureau of the Census, 1992). The only available lead emission factors for asphalt plants were for lead emissions from the rotary dryer (U.S. EPA, 1998a). The total amount of lead for each employment size class was estimated by multiplying asphalt production by an emission factor of 0.012 pounds of lead per million pounds of asphalt produced (U.S. EPA, 1995a). This emission factor was the greatest of five emission factors for rotary dryers (all with pollution control devices in place). The greatest emission factor was used because using lead air emissions after pollution control as a proxy for lead use significantly underestimates the amount of lead use. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-21).

In 1998, no facilities in this SIC code reported to TRI for lead or lead compounds. An additional 942 asphalt plants are estimated to submit TRI reports for lead and lead compounds at the 1-pound threshold, and an additional 26 plants are estimated to report lead and lead compounds at the 10-pound threshold. No asphalt plants are expected to report at the 100- and 1,000-pound thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from asphalt plants may be reduced because the concentration of lead in the aggregate feed, asphalt cement, and fossil fuel may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-21
SIC 2951: ASPHALT PAVING MIXTURES AND BLOCKS

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Hot-mix asphalt produced [d] (million lbs)	Amount of lead [e] (lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	2,658	1,134.6	0.472	471,748	5,661	2
10 to 19	485	422.6	0.176	175,710	2,109	4
20 to 49	325	580.7	0.241	241,445	2,897	9
50 to 99	106	168.0	0.007	69,852	838	8
100 to 499	26	99.2	0.041	41,246	495	19
Total	3,600	2,405.1	100.0%	1,000,000	12,000	

a. Some employee categories were combined because of combined facility data.
b. The number of facilities (3,600) estimated by the National Asphalt Pavement Association (1999) was multiplied by the percent of facilities in each facility size category from Bureau of the Census, 1996a.
c. U.S. Bureau of the Census, 1992.
d. National Asphalt Pavement Association, 1999. It was assumed that production was proportional to the cost of materials for each facility size class.
e. The amount of lead was estimated using an air emission factor of 0.012 lb Pb/MMlb of hot-mix asphalt produced; this is the greatest of five emission factors (all with control devices) provided by U.S. EPA, 1995a. Because total lead use is greater than lead emitted to air (especially after controls), this method underestimates the amount of total lead.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

Part of SIC 3231: Stained glass manufacturing

Commercial stained glass manufacturers produce stained glass windows, lamps, and other goods. During the manufacture of these items, lead came (a malleable edging material in the shape of a channel) and solder are used to join sections of glass. Lead came is greater than 90 percent lead by weight (Art Glass Suppliers Association, 2000). The remaining 10 percent includes antimony and tin. The tin/lead ratio of solder used in stained glass manufacturing may vary between 63/37 and 50/50 (Cedar Moon Glass Ltd., 2000).

Stained glass manufacturing facilities are a subset of SIC code 3231 (Glass Products, Made of Purchased Glass). The number of stained glass facilities with 10 or more employees used in this analysis is based on census data for SIC code 3231821 (Stained, leaded, and faceted glass and colored glass slabs). According to TRI data, 14 facilities in SIC code 3231 reported for lead and lead compounds. However, it is not known how many of these were stained glass facilities.

The Industry Source method was used to estimate the number of additional lead reports for stained glass manufacturing facilities. The amount of lead processed by commercial stained glass manufacturers with 10 employees was estimated by the Art Glass Suppliers Association to be 1,000 - 2,000 lbs/year (Art Glass Suppliers Association, 2000). This analysis assumes that this estimate is representative of the industry. It is, therefore, estimated that all 64 commercial stained glass manufacturers with 10 or more employees are expected to exceed the 1-, 10-, 100-, and 1,000-pound reporting thresholds (see Table A-22). If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from stained glass manufacturers would not be affected because the concentration of lead exceeds the current *de minimis* level.

TABLE A-22
SIC 3231821: STAINED GLASS

Number of Facilities [a]	Annual lead usage for a facility with 10 employees [b]	Number of facilities exceeding the 1-, 10-, 100-, and 1,000-lb thresholds
64	1,000 - 2,000 lbs	64

a. U.S. Bureau of the Census, 1992. Art Glass Suppliers Association, 2000. The number of companies with shipments of $100,000 or more for SIC code 3231821 was assumed to approximate the number or U.S. stained glass manufacturing firms with 10 or more employees.
b. Art Glass Suppliers Association, 2000.

SIC 3241: Cement, hydraulic

Lead and lead compounds may be emitted from process kilns and clinker grinders in cement manufacturing plants. Cement plants transform raw materials into clinkers (gray, hard, spherical intermediate products) that are then converted into finished Portland cement. Lead is expected to be present as a trace contaminant in raw material inputs, including silicon, aluminum, and/or iron (U.S. EPA, 1998a). Lead may be also emitted from fossil fuels, or as a result of the practice of burning hazardous waste as a supplemental fuel.

A combination of the Facility-specific Data Method and the Air Emission Factor Method was used to estimate the number of lead reports for SIC 3241. Facility-specific clinker production capacity data for 131 dry and 71 wet process kilns (active) were obtained (U.S. EPA, 1998a). The number of facilities (for both dry and wet kilns) was multiplied by the percent of establishments in SIC 3241 that had 10 or more employees (67.1%), yielding 88 dry and 48 wet process facilities (U.S. Bureau of the Census, 1996b). It was assumed that these facilities had the largest clinker production capacities, because facilities with a larger number of employees generally have greater production capacities than facilities with a smaller number of employees.

Each of the four lower thresholds was divided by a lead air emission factor to obtain the required throughput to exceed each threshold (U.S. EPA, 1998a). The lead air emission factor combined emission factors from the process kiln and clinker grinder, both without pollution control devices. For dry process kilns, an emission factor of 80 pounds of lead per million pounds of clinker produced was used; for wet process kilns, an emission factor of 60 pounds of lead per million pounds of clinker produced was used. The required throughput numbers were then applied to the list of facility-specific capacity data to estimate the number of facilities filing additional TRI reports at the lower reporting thresholds. Although the use of capacity data would tend to overestimate lead amounts, this bias is more than offset by the use of an air emissions factor (see Tables A-23a and A-23b).

In 1998, 25 facilities in this SIC code reported to TRI for lead or lead compounds. An additional 111 facilities in SIC 3241 are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from SIC 3241 may be reduced because the concentration of lead in the raw material and fossil fuel inputs may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-23a
SIC 3241: CEMENT, HYDRAULIC
FOR DRY PROCESS KILNS

Lead threshold	Clinker production required per facility [a] (million lbs)	Number of facilities with 10 or more employees [b]	Total clinker capacity [c] (million lbs)	Estimated total lead [d] (million lbs)
Greater than 1 lb	0.013	88		
Greater than 10 lbs	0.125	88		
Greater than 100 lbs	1.25	88		
Greater than 1,000 lbs	12.5	88		
Greater than 10,000 lbs	125	88		
Greater than 25,000 lbs	313	88		
Total			95,678	7.7

a. The required clinker production was estimated using a combined air emission factor from the process kiln and clinker grinding, both without control devices (U.S. EPA, 1998a, p. 5-127). Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.

b. Facility-specific clinker production capacity data for 131 dry process kilns was obtained from U.S. EPA, 1998a (Chap. 5). The number of kilns was multiplied by the percent of establishments in SIC 3241 that had 10 or more employees (67.1%) (U.S. Bureau of the Census, 1996b), yielding 88 facilities for dry kilns. It was assumed that these facilities had the largest clinker production capacities.

c. The total clinker capacity represents the 88 dry kilns with the largest clinker production capacities.

d. The estimated total lead was estimated by multiplying the total clinker capacity by an emission factor (80 lbs/MMlbs clinker produced for dry kilns) for process kiln and clinker grinding, both without control devices (U.S. EPA, 1998a, p. 5-127).

TABLE A-23b
SIC 3241: CEMENT, HYDRAULIC
FOR WET PROCESS KILNS

Lead threshold	Clinker production required per facility (million lbs)	Number of facilities with 10 or more employees [b]	Total clinker capacity [c] (million lbs)	Estimated total lead [d] (million lbs)
Greater than 1 lb	0.017	48		
Greater than 10 lbs	0.167	48		
Greater than 100 lbs	1.67	48		
Greater than 1,000 lbs	16.7	48		
Greater than 10,000 lbs	167	48		
Greater than 25,000 lbs	417	48		
Total			39,410	2.4

a. The required clinker production was estimated using a combined air emission factor from the process kiln and clinker grinding, both without control devices (U.S. EPA, 1998a, p. 5-127). Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
b. Facility-specific clinker production capacity data for 71 wet process kilns was obtained from U.S. EPA, 1998a (Chap. 5). The number of kilns was multiplied by the percent of establishments in SIC 3241 that had 10 or more employees (67.1%) (U.S. Bureau of the Census, 1996b), yielding 48 facilities for wet kilns. It was assumed that these facilities had the largest clinker production capacities.
c. The total clinker capacity represents the 48 wet kilns with the largest clinker production capacities.
d. The estimated total lead was estimated by multiplying the total clinker capacity by an emission factor (60 lbs/MMlbs clinker produced for wet kilns) for process kiln and clinker grinding, both without control devices (U.S. EPA, 1998a, p. 5-127).

SIC 3312: Blast furnaces and steel mills

Lead is a trace contaminant in base or alloyed steel and in coal used for coke production at iron and steel mills (*Ullman's*, 1990; U.S. EPA, 1998a). Lead may also be a trace constituent in scrap metal feed used in steelmaking.

The Lead Concentration Method was used to estimate the number of lead reports from SIC 3312. This analysis assumes that all facilities in SIC 3312 produce steel with the limiting (i.e., maximum allowable) concentration of lead. For this analysis, trace lead in steel is used as an estimate of the amount of lead and lead compound use in iron and steel mills. This estimate is a minimum estimate because there could be other uses of lead. For example, the amount of lead use from coke manufacturing in SIC 3312 could not be determined due to lack of data. However, while the National Air Pollutant Emission Trends Update reported zero lead emissions from coke manufacturing in 1997, lead is likely to be processed as a trace contaminant in the raw material feed (U.S. EPA, 1998b). Therefore, this analysis may underestimate the amount of lead use in iron and steel mills.

Because the available data did not differentiate between base steel that contains lead and base steel that does not contain lead, this analysis uses only lead in alloyed steel as a minimum estimate of lead and lead compound use in SIC 3312. The amount of alloyed steel produced by the industry was assumed to be proportional to the cost of materials for each employment size class (U.S. Bureau of the Census, 1996a; U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the alloyed steel production by the limiting (i.e., upper-limit) concentration of lead in base or alloyed steel (0.40%) (*Ullman's*, 1990). For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-24).

In 1998, 97 facilities in this SIC code reported to TRI for lead or lead compounds. An additional 174 iron and steel mills are estimated to submit TRI reports for lead and lead compounds at each of the four lower reporting thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from iron and steel mills may not be affected because the assumed concentration of lead in steel is above the current *de minimis* level. In addition, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-24
SIC 3312: BLAST FURNACES AND STEEL MILLS

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of lead [d] (lbs)	Average amount of lead per facility [e] (lbs)
1 to 9	208	17.8	0.1%	59,246	285
10 to 19	41	17.1	0.1%	56,916	1,388
20 to 49	42	92.1	0.4%	306,548	7,299
50 to 99	31	313.6	1.2%	1,043,794	33,671
100 to 249	41	1,380.3	5.4%	4,594,223	112,054
250 to 499	55	3,426.2	13.5%	11,403,845	207,343
500 to 999	24	3,740.6	14.7%	12,450,302	518,763
1,000 or more	37	16,404.5	64.6%	54,601,126	1,475,706
Total	479	25,392.2	100.0%	84,516,000	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992. Cost of materials was assumed to be proportional to the number of facilities within each facility size class.
d. Alloyed steel production (10,564,500 short tons; U.S. Bureau of the Census, 1996a) was multiplied by the limiting concentration of lead in base or alloy steel (0.40%; Ullman's, 1994) to obtain the amount of total lead. It was assumed that the amount of lead was proportional to the cost of materials for each facility size class. It was also assumed that all facilities produce steel with lead at the limiting concentration.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 3313: Electrometallurgical products – ferroalloys

Facilities that manufacture ferroalloys may process lead that is present as a trace contaminant in raw material feed. The National Air Pollutant Emission Trends Update reported total lead air emissions of 12,000 pounds from ferroalloy manufacturers in 1997 (U.S. EPA, 1998b).

The Sector Air Emissions Method was used to estimate the number of lead reports from SIC 3313. It was assumed that total lead air emissions were proportional to the cost of materials for each employment size class (U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the total air emissions by the percent of cost of materials for that employment size class. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-25).

In 1998, three facilities in this SIC code reported to TRI for lead or lead compounds. An additional 26 electrometallurgical plants are estimated to submit TRI reports for lead and lead compounds at the 1- and 10-pound thresholds, and an additional 17 plants are estimated to report at the 100-pound threshold. One electrometallurgical plant is expected to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from electrometallurgical plants may be reduced because the concentration of lead in the raw material and fossil fuel inputs may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-25
SIC 3313: ELECTROMETALLURGICAL PRODUCTS (FERROALLOYS)

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of lead [d] (lbs)	Average amount of lead per facility [e] (lbs)
1 to 9	4	4.7	0.6%	69	17
10 to 19	3	5.2	0.6%	76	25
20 to 49	6	13.0	1.6%	191	32
50 to 99	5	57.9	7.1%	850	170
100 to 249	11	363.4	44.5%	5,338	485
250 to 999	4	372.8	45.6%	5,476	1,369
Total	33	817.0	100.0%	12,000	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b. It was assumed that all facilities use lead in the production of ferroalloys.
c. U.S. Bureau of the Census, 1992.
d. U.S. EPA, 1998b (National Air Pollutant Emission Trends Update, 1997). It was assumed that air emissions were proportional to the cost of materials for each facility size class. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 3315: Steel wiredrawing and steel nails and spikes

Steel wire, nail, and spike manufacturing facilities (SIC 3315) process lead as an impurity in steel.

The Lead Concentration Method was used to estimate the number of additional reports for facilities producing steel wire, and steel nails and spikes. According to the American Wire Producers Association, the typical concentration of lead in high carbon steel is 0.0007%. This concentration value was used in this analysis, although the concentration of lead in other types of steel is lower. For example, a typical concentration in low carbon steel is 0.0001%. Shipments of steel wire of 724,879 tons in 1998 (American Iron and Steel Institute, 2000) were aggregated with shipments of steel nails and spikes of 965,400 tons in 1992 (Bureau of the Census, 1992) to estimate total production of steel products for SIC code 3315. The amount of lead associated with this production figure was estimated using the concentration of lead in high carbon steel which is 0.0007% (American Wire Producers Association, 2000). While the concentration of lead in low carbon steel is 0.0001%, the 0.0007% concentration was used in this analysis to provide a conservative estimate of the number of additional reports.

The total amount of lead used in this industry was estimated by multiplying steel wire, nail and spike shipments by the concentration of lead in high carbon steel. Lead use among employment size classes was assumed to be proportional to the cost of materials among employment size classes. For each employment size class, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in the size class (see Table A-26). In 1998, 27 facilities in SIC code 3315 reported to TRI for lead or lead compounds. An additional 210 facilities are expected to report for lead and lead compounds at the 1- and 10-pound reporting thresholds. At the 100-pound threshold, an additional 123 facilities are expected to report, and no additional report are expected at the 1,000-pound threshold.

If the current *de minimis* exemption for lead and lead compounds were retained, no additional reports would be expected from SIC code 3315 because the concentration of lead in steel is below the current *de minimis* level.

TABLE A-26
SIC 3315: STEEL WIREDRAWING AND STEEL NAILS AND SPIKES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility [e] (lbs)
1 to 4	46	9.1	0.4%	95	2
5 to 9	20	17.1	0.7%	166	8
10 to 19	36	38.5	1.6%	379	11
20 to 49	51	256.1	10.4%	2,461	48
50 to 99	64	721.1	29.4%	6,957	109
100 to 249	69	939.4	38.3%	9,063	131
250 to 499	13	183.5	7.5%	1,775	137
500 to 999	4	290.3	11.8%	2,792	698
Total	303	2,455.1	100%	23,688	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992. Production information for SIC codes 3315222, 3315223, 3315225, 3315230, and 3315200 was not available. These SIC codes represent 35 known facilities. It was not possible to subtract these facilities from the establishment total, since their distribution across the employment-size classes is unknown. This may result in an underestimate of lead use per facility. Cost of materials was assumed to be proportional to the number of facilities within each facility size class.
d. Steel wire production (724,879 tons; American Iron and Steel Institute, 2000) and steel nail and spike production (965,400 tons; Bureau of the Census, 1992) were multiplied by the assumed concentration of lead in steel (0.0007%; American Wire Producers Association, 2000) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size class.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in the class.

Iron foundries (SIC 3321, 3322)

Iron foundries manufacture iron castings from molten iron, scrap metal, carbon, and various alloying agents. The amount of lead and lead compounds processed by iron foundries depends mainly on the concentration of lead in the scrap metal feed (U.S. EPA, 1998a).

The Air Emission Factor Method was used to estimate the number of lead reports for SIC 3321 and 3322. The first step was to obtain a total amount of iron castings produced (SIC 3321 and 3322 combined). To determine the amount of iron castings produced in each SIC code, it was assumed that the amount of production for each SIC code was proportional to the cost of materials for each SIC code. Using available cost of materials data for each four-digit SIC code, the amount of iron castings produced for each SIC code was estimated. It was also assumed that production within each SIC code was assumed to be proportional to the cost of materials for each employment size class (USGS, 1999b; U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the production of iron castings by an emission factor of 400 pounds of lead per million pounds of iron produced (U.S. EPA, 1998a). This emission factor is a weighted average of the emission factors for cupola (70%), reverberatory furnace (15%), and electric arc furnace (15%), all without pollution control devices.[3] For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Tables A-27 and A-28).

In 1998, 21 facilities in SIC 3321 and two facilities in SIC 3322 reported to TRI for lead or lead compounds. An additional 484 iron foundries are estimated to submit TRI reports for lead and lead compounds at each of the four lower thresholds. Of these 484 foundries, 471 are gray and ductile iron foundries in SIC 3321; the remaining 13 are malleable iron foundries in SIC 3322. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from SIC 3322 may be reduced because the concentration of lead in the scrap metal and fossil fuel inputs may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

[3]Seventy percent of iron castings are produced using cupolas; the remaining 30 percent was divided evenly between reverberatory and electric arc furnaces (U.S. EPA, 1997b).

TABLE A-27
SIC 3321: GRAY AND DUCTILE IRON FOUNDRIES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of iron castings produced [d] (million lbs)	Emission factor [e] (lbs Pb/ million lbs)	Amount of lead [e] (lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	159	27.1	0.8%	157	400	62,800	395
10 to 19	67	35.2	1.0%	204	400	81,600	1,218
20 to 49	135	149.6	4.3%	867	400	346,800	2,569
50 to 99	101	241.1	6.9%	1,397	400	558,800	5,533
100 to 249	104	669.4	19.2%	3,880	400	1,552,000	14,923
250 to 499	49	741.3	21.3%	4,296	400	1,718,400	35,069
500 to 999	28	696.2	20.0%	4,035	400	1,614,000	57,643
1,000 or more	8	923.8	26.5%	5,354	400	2,141,600	267,700
Total	651	3,483.7	100.0%	20,191		8,076,400	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1999b. It was assumed that production was proportional to the cost of materials for each facility size class.
e. The amount of lead was estimated using an air emission factor of 400 lb Pb/MMlb iron produced; this is a weighted average of the emission factors for cupola (70%),reverb. furnace (15%), and electric induction furnace (15%), all without control devices (U.S. EPA, 1998a, p. 4-58). (The 70% figure from U.S. EPA, 1998a; the remaining 30% divided equally among remaining emission factors.) The maximum emission factor within a given range was used. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

TABLE A-28
SIC 3322: MALLEABLE IRON FOUNDRIES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of iron castings produced [d] (million lbs)	Emission factor [e] (lbs Pb/ million lbs)	Amount of lead [e] (lbs)	Average amount of lead per facility [f] (lbs)
1 to 9	11	0.4	0.2%	2	400	800	73
10 to 19	1	1.1	0.4%	6	400	2,400	2,400
20 to 99	8	12.0	4.9%	70	400	28,000	3,500
100 to 2,499	6	231.4	94.5%	1,341	400	536,400	89,400
Total	26	244.9	100.0%	1,419		567,600	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1999b. It was assumed that production was proportional to the cost of materials for each facility size class.
e. The amount of lead was estimated using an air emission factor of 400 lb Pb/MMlb iron produced; this is a weighted average of the emission factors for cupola (70%), reverb. furnace (15%), and electric induction furnace (15%), all without control devices. U.S. EPA, 1998a, p. 4-58). (The 70% figure from U.S. EPA, 1998a; the remaining 30% divided equally among remaining emission factors.) The maximum emission factor within a given range was used. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
f. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 3324, 3325: Steel foundries

Steel foundries manufacture steel castings from molten iron, scrap metal, carbon, and various alloying agents. The amount of lead and lead compounds processed by steel foundries depends mainly on the amount of lead in the scrap metal feed (U.S. EPA, 1998a).

The Sector Air Emissions Method was used to estimate the number of lead reports for SIC 3324 and 3325. The first step was to obtain a total amount of steel castings produced (SIC 3324 and 3325 combined). To determine the amount of steel castings produced in each SIC code, it was assumed that total lead air emissions for each SIC code was proportional to the cost of materials for each SIC code. Using available cost of materials data for each four-digit SIC code, the total lead air emissions for each SIC code was estimated. It was also assumed that total lead emissions within each SIC code was assumed to be proportional to the cost of materials for each employment size class (USGS, 1999b; U.S. Bureau of the Census, 1992).

The National Air Pollutant Emission Trends Update reported total lead air emissions of 338,000 pounds for steel foundries in 1997 (U.S. EPA, 1998b). This analysis assumes that total lead air emissions were proportional to the cost of materials for each employment size class (U.S.

Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the total air emissions by the percent of cost of materials for that employment size class. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Tables A-29 and A-30).

In 1998, no facilities in SIC 3324 and six facilities in SIC 3325 reported to TRI for lead or lead compounds. An additional 343 steel foundries are estimated to submit TRI reports for lead and lead compounds at the 1- and 10-pound thresholds. An additional 331 plants are estimated to report at the 100-pound threshold, and 90 plants are estimated to report at the 1,000-pound threshold. The breakdown between Steel investment foundries (SIC 3324) and Steel foundries, n.e.c. (SIC 3325) is shown in Table A-31. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from SIC 3324 may be reduced because the concentration of lead in the scrap metal and fossil fuel inputs may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-29
SIC 3324: STEEL INVESTMENT FOUNDRIES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity (lbs)	Amount of lead [d] (lbs)	Average amount of lead per facility [e]
1 to 9	21	4.4	0.7%	1,045	50
10 to 19	12	4.8	0.8%	1,140	95
20 to 49	37	22.4	3.7%	5,322	144
50 to 99	26	52.5	8.7%	12,473	480
100 to 249	29	116.5	19.2%	27,678	954
250 to 499	9	79.9	13.2%	18,982	2,109
500 to 999	6	147.8	24.4%	35,114	5,852
1,000 to 2,499	5	177.4	29.3%	42,146	8,429
Total	145	605.7	100.0%	143,900	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. U.S. EPA, 1998b (National Air Pollutant Emission Trends Update, 1997). It was assumed that air emissions were proportional to the cost of materials for each facility size class. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

TABLE A-30
SIC 3325: STEEL FOUNDRIES, N.E.C.

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity (lbs)	Amount of lead [d] (lbs)	Average amount of lead per facility [e]
1 to 9	92	8.9	1.1%	2,113	23
10 to 19	33	45.5	5.6%	10,804	327
20 to 49	82	63.6	7.8%	15,102	184
50 to 99	34	66.0	8.1%	15,672	461
100 to 249	45	314.1	38.4%	74,586	1,657
250 to 499	22	225.4	27.6%	53,524	2,433
500 to 2,499	9	93.9	11.5%	22,298	2,478
Total	317	817.4	100.0%	194,100	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. U.S. EPA, 1998b (National Air Pollutant Emission Trends Update, 1997). It was assumed that air emissions were proportional to the cost of materials for each facility size class. Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

TABLE A-31
SUMMARY OF ESTIMATED ADDITIONAL REPORTS FOR STEEL FOUNDRIES

SIC Code and Name	Number of Facilities			
	> 1 lb	> 10 lbs	> 100 lbs	> 1000 lbs
3324 – Steel investment foundries	124	124	112	20
3325 – Steel foundries, n.e.c.	219	219	219	70
TOTAL	**343**	**343**	**331**	**90**

SIC 3334, 3353, 3354, 3363, 3365: Aluminum processing facilities

Facilities that manufacture or process significant amounts of aluminum also manufacture or process lead because lead is an impurity in aluminum. Facilities that manufacture or process aluminum are classified in several SIC codes, including 3334 (Primary production of aluminum), 3353 (Aluminum sheet plate and foil), 3354 (Aluminum extruded products), 3363 (Aluminum die-casting), and 3365 (Aluminum foundries).

The Lead Concentration Method was used to estimate the number of additional reports expected from each type of aluminum processing facility. According to sampling data from Aluminum Association members, the lead concentration in alloyed and unalloyed aluminum is normally in the 0.001 - 0.01% range. However, concentrations may be as much as 0.02%. This analysis assumes alloyed and unalloyed aluminum have a typical lead concentration of 0.01% (Aluminum Association, 2000b). Within each SIC code, the total amount of lead was estimated by multiplying annual production of aluminum by the concentration of lead in aluminum. Lead use among employment size categories was assumed to be proportional to the cost of materials among employment size categories. For each employment size class, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the size category (see Tables A-32, A-33, A-34, A-35, and A-36). Aluminum processing facilities may also process lead from other sources, such as aluminum hardeners, which this analysis does not reflect (Aluminum Association, 2000b).

If the current *de minimis* exemption for lead and lead compounds were retained, no additional reports for SIC codes 3334, 3353, 3354, 3363, and 3365 would be expected because the concentration of lead in aluminum is below the current *de minimis* level.

Primary Production of Aluminum (SIC 3334)

Primary aluminum producers make aluminum ingot from bauxite in a three step process. First, alumina is extracted from the bauxite ore. Then, the alumina is electrolytically reduced to pure molten aluminum. Finally, the molten aluminum is mixed with other metals to form specific alloys (U.S. EPA, 1995c). Production of primary aluminum was 4,232,034 tons in 1999 (Aluminum Extruders Council, 2000b). SIC code 3334 covers facilities engaged in the primary production of aluminum. This SIC code designation does not include secondary production of aluminum. Secondary production of aluminum is covered in this analysis under SIC code 3341 (Secondary smelting and refining of nonferrous metals).

In 1998, three facilities in SIC 3334 reported to TRI for lead or lead compounds. At the 1- and 10-pound thresholds, it is estimated that all facilities with 10 or more employees would report, or an additional 30 facilities reporting for lead or lead compounds. An additional 20 facilities are estimated to report at the 100- and 1,000-pound thresholds.

TABLE A-32
SIC 3334: PRIMARY PRODUCTION OF ALUMINUM

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	8	1.8	0.0%	0	0
5 to 99	18	8.1	0.2%	1,693	94
100 to 499	4	256.3	6.1%	51,631	12,908
500 to 999	14	2,363.4	55.9%	473,141	33,796
1,000 +	5	1,597.3	37.8%	319,942	63,988
Total	49	4,226.9	100.0%	846,407	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b. According to 1992 Bureau of the Census Data, there are 8 facilities within the 5 - 9 employee range.
c. U.S. Bureau of the Census, 1992.
d. Production of primary aluminum (4,232,034 tons; Aluminum Association, 2000b) were multiplied by the assumed concentration of lead in aluminum (0.010%; Aluminum Association, 2000b) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size category.
e. For each facility size category, the average amount of lead was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the category.

Aluminum sheet, plate and foil (SIC 3353)

SIC code 3353 covers facilities primarily engaged in flat rolling aluminum and aluminum-base alloy shapes. Production shipments of sheet, plate and foil products were 5,113,288 tons in 1999 (Aluminum Association, 2000b). This production information does not include production by approximately four facilities (Bureau of the Census, 1992) in SIC code 3353, that manufacture welded aluminum tubes (Aluminum Association, 2000b).

In 1998, three facilities in SIC 3353 reported to TRI for lead or lead compounds. An additional 56 facilities are estimated to report at the 1-, 10-, and 100-pound thresholds. An additional 44 facilities are estimated to report at the 1,000-pound threshold.

TABLE A-33
SIC 3353: ALUMINUM SHEET PLATE AND FOIL

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	12	5.3	0.1%	1,023	85
5 to 9	9	5.7	0.1%	1,023	114
10 to 19	4	20.9	0.3%	3,068	767
20 to 49	8	37.0	0.5%	5,113	639
50 to 99	3	113.2	1.6%	16,363	5,454
100 to 249	20	771.8	10.6%	108,402	5,420
250 to 499	11	665.1	9.1%	93,062	8,460
500 to 999	6	2,066.4	28.4%	290,435	48,406
1,000+	7	3,587.7	49.3%	504,170	72,024
Total	80	7,273.1	100.0%	1,022,658	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. Production shipments of aluminum sheet, plate, and foil products (5,113,288 tons; Aluminum Association, 2000b) were multiplied by the assumed concentration of lead in aluminum (0.010%; Aluminum Association, 2000b) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size category.
e. For each facility size category, the average amount of lead was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the category.

Aluminum Extruded Products (SIC 3354)

The end users of extruded aluminum products include building and construction, transportation, and consumer durable goods. Aluminum is extruded by placing a heated billet of softened metal in an extrusion press, and forcing it through a precision opening, known as a die, to produce the desired shape (Aluminum Extruders Council, 2000a). Production of extruded aluminum products was 2,150,000 tons in 1998 (Aluminum Extruders Council, 2000b). SIC code 3354 covers aluminum extruding facilities.

In 1998, six facilities in SIC 3354 reported to TRI for lead or lead compounds. An additional 152 facilities are estimated to report at the 1-, 10-, and 100-pound thresholds. An additional 110 facilities are estimated to report at the 1,000-pound threshold.

TABLE A-34
SIC 3354: ALUMINUM EXTRUDED PRODUCTS

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	24	2.9	0.1%	430	18
5 to 9	7	5.2	0.2%	860	123
10 to 19	12	19.8	0.8%	3,440	287
20 to 49	30	105.9	4.5%	19,350	645
50 to 99	27	256.0	10.9%	46,870	1,736
100 to 249	54	838.7	35.6%	153,080	2,835
250 to 2,499	35	1130.3	47.9%	205,970	5,885
Total	189	2358.8	100.0%	430,000	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. Production of aluminum extruded products (2,150,000 tons; Aluminum Extruders Council, 2000b) were multiplied by the assumed concentration of lead in aluminum (0.010%; Aluminum Association, 2000b) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size category.
e. For each facility size category, the average amount of lead was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the category.

Aluminum Die-Castings (SIC 3363)

The aluminum die casting process utilizes a permanent die (metal mold) into which molten aluminum is forced under pressure. This process contrasts sand casting which requires a new sand mold for each casting. Shipments of die cast aluminum were 970,000 tons in 1999 (North American Die Casting Association, 1999). This is an overestimate of U.S. production because the production number includes Canada. SIC code 3363 covers aluminum die casters. Other types of aluminum casting methods are covered under SIC code 3365 (Aluminum foundries).

In 1998, nine facilities in SIC 3363 reported to TRI for lead or lead compounds. An additional 246 facilities are estimated to report at the 1-, 10-, and 100-pound thresholds. An additional 23 facilities are estimated to report at the 1,000-pound threshold.

TABLE A-35
SIC 3363: ALUMINUM DIE CASTING

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	38	5.6	0.4%	776	20
5 to 9	23	9.2	0.7%	1,358	59
10 to 19	42	29.9	2.3%	4,462	106
20 to 49	70	93.6	7.3%	14,162	202
50 to 99	42	163.1	12.6%	24,444	582
100 to 249	69	420.4	32.6%	63,244	917
250 to 499	22	345.9	26.8%	51,992	2,363
500 to 2,499	10	223.3	17.3%	33,562	3,356
Total	316	1291.0	100.0%	194,000	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. Aluminum die casting shipments (970,000 tons; North American Die Casting Association, 1999) were multiplied by the assumed concentration of lead in aluminum (0.010%; Aluminum Association, 2000b) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size category.
e. For each facility size category, the average amount of lead was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the category.

Aluminum Foundries (SIC 3365)

Foundries make parts from molten metal according to end-user specifications (U.S. EPA, 1997c). End-users include automotive, aviation, marine, machine parts, and cooking utensils. Shipments of cast aluminum (excluding die casts) were 397,000 tons in 1999 (American Foundrymen's Society, 2000). SIC code 3365 covers aluminum foundries. This SIC code designation does not include aluminum die casting facilities, which are covered under SIC code 3363.

In 1998, seven facilities in SIC 3365 reported to TRI for lead or lead compounds. An additional 369 facilities are estimated to report at the 1- and 10-pound thresholds. An additional 250 facilities are estimated to report at the 100-pound threshold, and an additional 16 facilities are estimated to report at the 1,000-pound threshold.

TABLE A-36
SIC 3365: ALUMINUM FOUNDRIES

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials (million $) [c]	Estimated percent of industry activity [d]	Amount of lead (lbs) [d]	Average amount of lead per facility (lbs) [e]
1 to 4	131	7.8	1.0%	794	6
5 to 9	97	21.0	2.6%	2,064	21
10 to 19	119	38.8	4.8%	3,811	32
20 to 49	125	140.4	17.3%	13,736	110
50 to 99	52	112.5	13.9%	11,037	212
100 to 249	57	245.6	30.2%	23,979	421
250 to 999	23	246.1	30.3%	24,058	1,046
Total	604	812.2	100.0%	79,479	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. Cast aluminum shipments (794,000,000 lbs; American Foundrymen's Society, 1999) were multiplied by the assumed concentration of lead in aluminum (0.010%; Aluminum Association, 2000b) to estimate the amount of total lead. It was assumed that lead use was proportional to the cost of materials for each facility size category.
e. For each facility size category, the average amount of lead was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in the category.

SIC 3341: Secondary smelting and refining of nonferrous metals

SIC 3341 consists of secondary smelting and refining facilities for various nonferrous metals, including lead, copper, aluminum, antimony, gold, magnesium, nickel, silver, tin, and zinc. The following subsections present estimated number of lead reports for secondary lead, copper, and aluminum smelting. Copper and aluminum smelting are combined because the same approach to estimate number of reports was used for both sectors.

Secondary lead smelting

Secondary lead smelters produce lead and lead alloys by reclaiming scrap lead, mainly from used automobile batteries. Secondary lead smelters produced 1,892 million pounds of refined lead in 1990, about 69 percent of the total refined lead (USGS, 1998a).

The Lead Production/Consumption Method was used to estimate the number of lead reports for secondary lead smelters. Seventeen of the 29 plants in the United States accounted for more than 98 percent of the total secondary lead production (USGS, 1999a). These 17 plants were placed in a "major" facility size category. The remaining twelve plants were placed in a "minor" facility size category. The average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-37).

It is estimated that all secondary lead smelters already report for lead and lead compounds to TRI because of the high volumes of lead produced; therefore, no additional reports are expected. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from secondary lead smelters would not be affected because lead is manufactured.

Secondary copper and aluminum smelting

Secondary copper smelters and secondary aluminum smelters process scrap metals to recover refined copper and aluminum, respectively. Lead emissions from secondary copper and aluminum smelters depend on the lead content of the scrap metal feed.

The Air Emission Factor Method was used to estimate the number of lead reports for secondary lead smelters. The total amount of lead for each sector was calculated by multiplying the amounts of secondary copper and aluminum produced by their respective emission factors (USGS, 1999c). The emission factor used for secondary copper smelting was 25,000 pounds of lead per million pounds of copper produced (U.S. EPA, 1998a). This air emission factor was the greatest of three emission factors given for reverberatory furnaces in secondary copper smelters. The emission factor used for secondary aluminum smelting was 11.5 pounds of lead per million pounds of aluminum produced (U.S. EPA, 1998a). This air emission factor is the sum of the greatest emission factor for the burning/drying step and the emission factor for the reverberatory furnace, both with pollution control devices.[4] The average amount of lead per facility was calculated by dividing the amount of lead by the number of facilities with 10 or more employees (see Table A-37).

Because of the high volume of secondary copper produced, it is estimated that all secondary copper smelters already report for lead and lead compounds to TRI at the current thresholds; therefore, no additional reports are expected. An additional 10 secondary aluminum smelters are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, and 100-pound thresholds. No smelters are expected to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, the number of

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[4]The emission factor for the burning/drying step was the greatest of three emission factors (all with pollution control devices) for this process step. The greatest emission factor was used due to the fact that using lead air emissions after pollution control as a proxy for lead use significantly underestimates the amount of lead use.

additional reports would not be affected because the concentration of lead in the scrap metal feed is likely to exceed the current *de minimis* level.

SIC 3351: Copper rolling and drawing – brass and bronze

Brass (copper-zinc) and bronze (copper-tin) alloys often incorporate other metals, including nickel and lead, to modify the alloy's physical characteristics. In particular, lead improves the manipulability of brass and bronze (U.S. EPA, 1991). Brass and bronze alloys may incorporate lead as an intended component or as a trace contaminant; the amount of lead depends on the alloy composition, furnace and fuel type, smelting temperature, and other operating parameters (U.S. EPA, 1998a). It is likely that the lead is processed or manufactured as a byproduct in the production of brass and bronze.

The Lead Production/Consumption Method was used to estimate the number of lead reports for SIC 3351. There are 126 facilities in SIC 3351. It is assumed that all of them use lead in the production of brass and bronze. If the actual number of facilities in SIC 3351 that process lead in their operations is lower, the average amount of lead per facility for each employment size class would increase.

The U.S. Geological Survey reported total lead consumption of 9,724,000 pounds for brass and bronze smelters in 1997 (USGS, 1998a). This analysis assumes that total lead consumption was proportional to the cost of materials for each employment size class (U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the total lead consumption by the percent of cost of materials for that employment size class. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-38).

In 1998, 18 facilities in SIC 3351 reported to TRI for lead or lead compounds. An additional 82 facilities in SIC 3351 are estimated to submit TRI reports for lead and lead compounds at each of the four lower thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports for facilities producing bronze alloys may be reduced because the concentration of lead in the raw material and fossil fuel inputs may be below the current *de minimis* level. However, these facilities would not be able to take advantage of the *de minimis* exemption if lead and lead compounds are manufactured as a byproduct during combustion or other high-temperature activities.

TABLE A-37
SIC 3341: SECONDARY SMELTING AND REFINING OF NONFERROUS METALS

Secondary lead smelting:			
Facility size [a]	Number of facilities [a]	Lead produced [b] (million lbs)	Average amount of lead produced per facility [c] (million lbs)
Major	17	2,226	131
Minor	3	11	4
Total	20	2,237	

Secondary aluminum smelting:			
Number of facilities [d]	Total aluminum produced [e] (million lbs)	Amount of lead [f] (lbs)	Average amount of lead per facility (lbs)
53	3,207	36,881	696

Secondary copper smelting:			
Number of facilities [g]	Total copper produced [h] (million lbs)	Amount of lead [i] (million lbs)	Average amount of lead per facility (million lbs)
2	620	16	8

a. USGS, 1999a. 17 of the 29 plants accounted for more than 98% of the total secondary lead production. The 29 plants were multiplied by the number of facilities in SIC 3341 that have 10 or more employees (69.2%) (U.S. Bureau of the Census, 1996b), yielding 20 plants. It was assumed that all 17 of the major plants have 10 or more employees; the remaining 3 plants are minor.
b. USGS, 1999a. The total secondary lead from minor plants (2% of total production) was divided equally among the 12 minor plants. The amount in the table for minor plants represents the production from the 3 minor plants assumed to have 10 or more employees.
c. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.
d. U.S. EPA, 1998g presents 76 smelters citing USGS and Aluminum Association data from 1997. Multiplying this by the percent of facilities in SIC 3341 with 10 or more employees (69.2%) (U.S. Bureau of the Census, 1996b) yields 53 smelters.
e. USGS, 1999e. This amount was multiplied by the percent of cost of materials for facilities in SIC 3341 with 10 or more employees (96.9%) (U.S. Bureau of the Census, 1996b).
f. The amount of lead was estimated using a combined air emission factor from two process steps, both with control devices (the greatest emission factor was used from the burning/drying step)(11.5 lbs/MMlbs aluminum produced; U.S. EPA, 1998a, p. 4-51). Because total lead use is greater than lead emitted to air (especially after controls), this method underestimates the amount of total lead.
g. The number of facilities in USGS, 1999d, was multiplied by the percent of establishments in SIC 3341 that had 10 or more employees (69.2%) (U.S. Bureau of the Census, 1996b).
h. USGS, 1999d (Mineral Commodity Summaries - Copper). This amount was multiplied by the percent of cost of materials for facilities in SIC 3341 with 10 or more employees (96.9%) (U.S. Bureau of the Census, 1992).
i. The amount of lead was estimated using an air emission factor with no control device (the greatest emission factor was used) (25,000 lbs/MMlbs copper produced; U.S. EPA, 1998a, p. 4-37). Because total lead use is greater than lead emitted to air, this method underestimates the amount of total lead.

TABLE A-38
SIC 3351: COPPER ROLLING AND DRAWING (BRASS AND BRONZE)

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity (lbs)	Amount of lead [d] (lbs)	Average amount of lead per facility [e]
1 to 9	26	13.5	0.3%	29,257	1,125
10 to 19	7	5.5	0.1%	11,919	1,703
20 to 49	18	132.0	2.9%	286,064	15,892
50 to 99	24	206.0	4.6%	446,433	18,601
100 to 249	27	1,322.2	29.5%	2,865,405	106,126
250 to 499	16	1,581.3	35.2%	3,426,914	214,182
500 to 2,499	8	1,226.5	27.3%	2,658,009	332,251
Total	126	4,487.0	100.0%	9,724,000	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1998a. It was assumed that production was proportional to the cost of materials for each facility size class. It was also assumed that all facilities use lead.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 3471: Plating and polishing

The plating and polishing industry (SIC 3471) is made up of facilities primarily engaged in electroplating, plating, anodizing, coloring, and finishing of metals and formed products. These metal finishing operations usually involve a series of cleaning, surface preparation, metal deposition operations, and numerous finishing steps. Lead may be processed intentionally in tin/lead plating operations, as an impurity in commonly plated metals such as copper or zinc, or in anode metal used in processes such as hard chrome plating and anodizing.

The Lead Concentration and Industry Source Methods were used to estimate the number of lead reports expected from the plating and polishing industry due to lead processing. With over 20 different types of metals used in the metal finishing industry, this analysis focused on processes that were both known to contain lead and were relatively common. Therefore, the number of facilities that are expected to report at the lower thresholds for their tin/lead, copper, and zinc plating processes were estimated (see Tables A-39 and A-40). While the number of facilities may be overestimated due to the double-counting of facilities that have more than one of these processes (e.g., both copper and zinc plating processes), an underestimate may result from analyzing only three of the many metal plating processes in use.

Concentrations of lead in these operations were estimated from several sources. The concentration of lead in tin/lead plating formulations varies by application, from those formulations used on steel for corrosion protection containing over 80% lead, to those used for circuit boards containing 37% lead, to those used for other electronic applications where the lead content is only 2 - 10 % (AESF, 1999). For this analysis, a lead concentration of 37% was assumed to be relatively representative of tin/lead plating because circuit board plating is a common application, and because 37% is the median concentration value. For copper plating, the concentration of lead as an impurity was assumed to be 1% (see SIC 3331 analysis). For zinc plating, an average concentration of 0.6% lead in zinc was used (USGS, 2000b).

The quantity of each metal used per facility is subject to significant variation due to differences in the size, shape, and complexity of parts plated (e.g., flat plates versus complex parts with blind vias), the plating thickness required, the plating method used, the percentage of plating operations in the facility using each metal, and numerous other variables. This variability increases the uncertainty of the estimates of lead use per facility. The number of facilities expected to report at each of the reporting thresholds was estimated based on information from industry sources who approximated a range of copper, zinc, and tin/lead use per employee size category. The lead concentrations for these metals were then applied to the industry source estimates to obtain lead use per employee category.

In 1998, 20 facilities in SIC 3471 reported to TRI for lead or lead compounds. An additional 408 facilities are expected to report at the 1-pound reporting threshold, 333 facilities are expected to report at the 10-pound threshold, 157 facilities at the 100-pound thresholds and 83 facilities are expected to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would be reduced because some, but not all, sources of lead in this industry are typically below the current *de minimis* level.

TABLE A-39
SIC 3471: PLATING AND POLISHING

Facility size by number of employees	Number of facilities in SIC 3471[a]	Number of facilities using Zn [b]	Lead per facility using Zn (lbs) [c]	Number of facilities using Cu [b]	Lead per facility using Cu (lbs) [d]	Number of facilities using Sn/Pb [b]	Lead per facility using Sn/Pb (lbs) [e]
1 to 9	1,688	236	>1 and <10	523	>1 and <10	0	<100
10 to 19	723	101	>1 and <10	224	>1 and <10	72	≥100 and <1000
20 to 49	692	97	≥10 and <100	215	>1 and <10	69	>1000
50 to 99	244	34	≥10 and <100	76	>1 and <10	24	>1000
100 to 249	90	13	≥10 and <100	28	≥10 and <100	9	>1000
250 to 499	13	2	≥100 and <1000	4	≥10 and <100	1	>1000
500 to 999	1	0	≥100 and <1000	0	≥10 and <100	0	>1000
Total	3,451	483		1,070		175	

a. U.S. Bureau of the Census, 1996b.
b. American Electroplaters and Surface Finishers Society, 1999. The percent of facilities engaged in zinc plating and copper plating processes was estimated based on the self-reported information provided by approximately 1,200 facilities.
c. For each size category, average lead per facility was estimated based on input from Industry Sources for Plating and Polishing on zinc use per employee category multiplied by the concentration of lead in zinc (0.6%; USGS, 2000b).
d. For each size category, average lead per facility was estimated based on input from Industry Sources for Plating and Polishing on copper use per employee category multiplied by the concentration of lead in copper.
e. For each size category, average lead per facility was estimated based on input from Industry Sources for Plating and Polishing on tin/lead use per employee category multiplied by the concentration of lead in tin/lead plating (37%; AESF, 1999).

TABLE A-40
SIC 3471: PLATING AND POLISHING SUMMARY of REPORTS

Facility size by number of employees	Number of facilities in 3471 exceeding a threshold of: 1 lb.	10 lb.	100 lb.	1,000 lb.
1 to 9	N/A	N/A	N/A	N/A
10 to 19	397	72	72	0
20 to 49	381	166	69	69
50 to 99	134	58	24	24
100 to 249	50	50	9	9
250 to 499	7	7	3	1
500 to 999	0	0	0	0
Total	428 [a]	353	177	103

a. Of the 1,200 facilities listing processes, 298 facilities (24%) specified Zn, Cu, and/or Sn/Pb plating (AESF, 1999). Therefore, to avoid double-counting, it was estimated that a maximum of 24% of the facilities with 10 or more employees (428 facilities) could report for lead use associated with these processes.

Part of SIC 3479: Galvanizing

Galvanizing is a corrosion protection process for steel items ranging in size from highway bridges to nails. In the galvanizing process, zinc is metallurgically bonded to the steel, sealing it from the environment. The process involves processing the steel through a series of baths including: a caustic cleaner; a hydrochloric or sulfuric acid pickling bath to remove rust and scale; a flux bath to prevent oxides from forming on the steel prior to galvanizing; a molten zinc bath; and a water quench to cool the steel and stop the galvanizing process. Trace amounts of lead occur naturally in the zinc used in this process. The concentration of lead in the zinc varies from 0.003% to 1.4% (30 to 1400 ppm), depending on the grade of zinc used (see Table A-41).

The Lead Concentration Method was used to estimate the number of additional reports expected from the galvanizing industry. This sector is not distinctively defined by an SIC code, but is part of SIC code 3479, *Metal Coating, Engraving (except Jewelry and Silverware) and Allied Services.* Based on trade association information, it is estimated that there are 214 galvanizing facilities in the U.S. (American Galvanizers Association, 2000). Assuming that the employment patterns in the galvanizing industry follow the same distribution as SIC 3479, it was estimated that there are 120 galvanizing facilities with 10 or more employees (U.S. Bureau of the Census, 1996b). Based on the amount of zinc by grade consumed in the galvanizing industry, it is estimated that all galvanizing facilities with 10 or more employees would process more than 1,000 pounds of lead annually (see Table A-42).

In SIC 3479, 37 facilities filed a TRI report in 1998 for lead or lead compounds. Based on the estimated number of facilities processing more than 25,000 pounds of lead in Table A-42, it is assumed that 27 of the 37 reports were from the galvanizing industry. This method assumes that all facilities are using a grade of zinc with a lead concentration that is greater than the current *de minimis* level. However, an industry source notes that many facilities have shifted to higher grade zinc (International Lead and Zinc Research Organization, 2000), therefore, this method may overestimate the number of current reporters in the galvanizing industry. With 27 of the estimated 120 facilities with 10 or more employees already reporting, an estimated 93 additional facilities would report at each of the 1-, 10-, 100-, and 1,000-pound thresholds.

This analysis may overestimate the number of facilities expected to submit additional reports for two reasons: 1) the lead concentrations assumed for each grade of zinc are the maximum concentrations present in each grade; and 2) individual facilities using only High Grade or Special High Grade zinc, would process less lead than estimated. However, even those facilities using the purest grades of zinc would process more than 10 pounds of lead annually.

If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from galvanizers would be reduced because facilities using only High or Special High grade zinc (where the lead concentration is less than the current *de minimis* level) would not be expected to report as a result of zinc usage. Data on the number of facilities using only these grades, however, was not available.

TABLE A-41
SIC 3479: LEAD USED IN GALVANIZING

Facility size by number of employees [a]	Zinc grade used in galvanizing	Zinc used in galvanizing (lbs/yr) [b]	Maximum concentration of lead in zinc [c]	Estimated lead processed in galvanizing (lbs/yr)
214	Special High Grade	231,420,000	0.003%	6,943
	High Grade	119,677,200	0.030%	35,903
	Prime Western	240,236,000	1.4%	3,363,304
	Remelt + other grades	113,506,000	0.5%	567,530
Total				3,973,680

a. American Galvanizers Association, 2000. AGA has 75 member companies operating 110 plants. There are another 71 galvanizing companies who are not members of the Association. Based on the member company ratio of 1.5 plants per company, the total number of galvanizing facilities is estimated to be 214. This estimate may overestimate the number of facilities since the non-member companies represent only 25% of industry capacity and therefore, probably do not operate as many plants per company as members do.
b. USGS, 1998c.
c. USGS, 2000b.

TABLE A-42
SIC 3479: AVERAGE LEAD USE PER GALVANIZING FACILITY

Facility size by number of employees	Number of facilities in SIC 3479 [a]	Estimated number of galvanizing facilities [b]	Cost of materials for SIC 3479 (million $) [a,c]	Estimated percent of industry activity	Average lead per facility (lbs)
1 - 4	595	62	64.6	2.4%	1,538
5 - 9	303	32	70.3	2.6%	3,229
10 - 19	414	43	182.0	6.8%	6,284
20 - 49	479	50	468.2	17.5%	13,908
50 - 99	167	17	651.9	24.3%	56,800
100 - 249	82	9	752.0	28.1%	124,067
250 - 499	13	1	491.6	18.3%	727,183
Total	2053	214	2680.6	100%	

a. U.S. Bureau of the Census, 1996b.
b. The 2,053 facilities in SIC 3479 were scaled to represent the 214 galvanizers only, based on the assumption that the employment patterns in galvanizing facilities are similar to the distribution in the SIC code as a whole.
c. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates are relative to production, and therefore, is proportional to the facility's zinc use.

SIC 3482: Small arms ammunition

Lead is used in ammunition because of its high density, which allows a bullet to maintain trajectory and velocity. The concentration of lead in ammunition is typically 99.7 to 99.9 percent (U.S. EPA, 1991). In 1997, 122 million pounds of lead were consumed for ammunition, most of it from secondary (recycled) lead (USGS, 1998a). However, "green bullets" containing tungsten instead of lead are being developed; the overall goal is to replace all leaded bullets in the U.S. armed services (which consume only a portion of all bullets) by 2003 (Stone, 1999).

The Lead Production/Consumption Method was used to estimate the number of lead reports for SIC 3482. The total lead consumption for the sector was assumed to be proportional to the cost of materials for each employment size class (USGS, 1998a; U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the total lead consumption by the percent of cost of materials for that employment size class. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-43).

In 1998, 15 facilities in SIC 3482 reported to TRI for lead or lead compounds. An additional 17 facilities in SIC 3482 are estimated to submit TRI reports for lead and lead compounds at each of the four lower thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from SIC code 3482 would not be affected because the concentration of lead in bullets exceeds the current *de minimis* level.

TABLE A-43
SIC 3482: SMALL ARMS AMMUNITION

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of lead [d] (million lbs)	Average amount of lead per facility [e] (million lbs)
1 to 9	75	5.5	1.4%	1.7	0.022
10 to 19	12	4.8	1.2%	1.5	0.12
20 to 49	9	3.3	0.8%	1.0	0.11
50 to 99	2	9.0	2.3%	2.8	1.4
100 to 499	4	125.9	31.7%	39	9.7
500 to 2,499	5	249.2	62.7%	76	15
Total	107	397.7	100.0%	122	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1998a. It was assumed that production was proportional to the cost of materials for each facility size class.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 367: Electronic components

The electronic components industry (SIC 367) is composed of facilities manufacturing parts for incorporation into electronic equipment, including electron tubes (SIC 3671), printed circuit boards (SIC 3672), semiconductors (SIC 3674), capacitors (SIC 3675), resistors (SIC 3676), coils and transformers (SIC 3677), connectors (SIC 3678), and other electronic components (SIC 3679). Lead is used in these sectors in a variety of applications, as described below.

To estimate the number of lead reports expected from electronic components manufacturers at the lower reporting thresholds, each 4-digit SIC was analyzed separately. For each analysis, with the exception of SIC 3672, the Industry Source Method was used to estimate the number of additional lead reports expected. Information gathered from industry sources was used to estimate typical lead use per employee. Lead use per employee was used to estimate the size of the facility, as measured by number of employees. This information was then used to estimate the number of facilities exceeding each of the four reporting thresholds. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that size category. The following estimates do not reflect facility characteristics other than size that may influence production levels. The Lead Concentration Method was used for the printed circuit board analysis (SIC 3672), and is described in greater detail in that section.

Electron Tubes (SIC 3671)

Facilities in SIC 3671 manufacture electron tubes for applications such as audio and video equipment, communications, measurement equipment, light sources, and other electronic devices. Products include cathode ray tubes, gas and vapor tubes, photomultiplier tubes, television tubes, and vacuum tubes. Cathode ray tubes (CRTs), found in video displays, computer monitors, televisions and oscilloscopes, are electrical devices which display images by exciting phosphor dots with a scanned electron beam. CRTs use leaded glass to shield viewers from radiation, and the phosphors coating used in cathode ray tubes may contain zinc, copper, aluminum, silver, or gold compounds. A lead-containing frit (a solder glass with organic binders) is used to seal the CRT to the front, glass panel. The manufacturing process differs for the different products, but generally involves the assembly of the electrode system made from high precision materials which may be gold, copper, or graphite plated. To form the electrical connection, the assembly is soldered to a tube base, and inserted into a glass envelope, which is then hermetically sealed to the base.

In 1998, 10 electron tube manufacturers reported to TRI for lead or lead compounds. An additional 99 facilities are expected to report at the 1-, 10-, and 100-pound reporting thresholds, and 25 additional facilities are expected to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates may be reduced because the lead concentration in some, but not all of these sources is below the current *de minimis* level.

TABLE A-44
SIC 3671: ELECTRON TUBE MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	64	7	35
10 to 19	34	7	102
20 to 49	23	7	242
50 to 99	17	7	522
100 to 249	15	7	1,222
250 to 499	10	7	2,622
500 to 999	4	7	5,247
1,000 or more	6	7	7,000 or more
Total	173		

a. U.S. Bureau of the Census, 1996b.
b. Electron Tube Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that category.

Printed Circuit Boards (SIC 3672)

Printed Circuit Boards provide electrical interconnections and a surface for mounting electronic components. Circuit board manufacturers use lead in tin/lead etch resists and surface finishes. Tin/lead is be electrically deposited over the copper plating during the manufacturing on the internal layers of a circuit board. This coating, called an etch resist, protects the desired copper circuitry while allowing for chemical removal of unwanted copper surfaces. The tin/lead etch resist is then stripped from the circuit board prior to subsequent processing. Tin/lead is also used as a final surface finish on the pads and surfaces of the board where components will be attached by an assembly facility.

The Lead Concentration Method was used to estimate the number of lead reports expected from the printed circuit board industry due to lead processing. The concentration of lead in the tin/lead solder used in this industry is typically 37% (Coombs, 1996). Based on information from several facilities, the average amount of lead used per surface square foot (ssf) of circuit board produced is approximately 0.01 pounds/ssf (U.S. EPA, 1995b). This analysis assumes these facilities were representative of the industry as a whole. The total annual production for the industry was estimated to be 250 million ssf (PC Fab, 1997; U.S. EPA, 1995b). The production throughput per employment size category was assumed to be proportional to the cost of materials for that employment category. The total amount of lead per employment size category was estimated by multiplying production throughput by the average lead use per ssf. The lead per facility was estimated by dividing the lead per employment size category by the number of facilities in the category.

In 1998, 26 circuit board manufacturers reported to TRI for lead or lead compounds. An additional 898 facilities are expected to report at the 1-, 10-, and 100-pound reporting thresholds, and an additional 351 facilities are expected to report at the 1,000-pound threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would not be affected because the concentration of lead used exceeds the current *de minimis* level.

TABLE A-45
SIC 3672: PRINTED CIRCUIT BOARD MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Cost of materials ($ million) [b]	Estimated percent of industry activity	Amount of lead (lbs) [c]	Average lead per facility (lbs) [d]
1 to 9	567	60.9	2.0%	50,000	88
10 to 19	246	73.5	2.5%	62,500	254
20 to 49	301	241.5	8.1%	202,500	673
50 to 99	166	396.5	13.3%	332,500	2,003
100 to 249	142	679.3	22.9%	572,500	4,032
250 to 499	44	456.2	15.3%	382,500	8,693
500 to 999	19	447.5	15.1%	377,500	19,868
1000 or more	6	617.4	20.8%	520,000	86,667 or more
Total	1,491	2,972.8	100%	2,500,000	

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. It is assumed that cost of materials estimates relative production, and therefore, is proportional to the facility's lead use.
c. PC Fab, 1997; U.S. EPA, 1995b. Amount of lead processed was derived from 1995 total industry sales ($7.39 billion) multiplied by the mean sales dollars per ssf of production ($29.82) to estimate total industry production (~250,000,000 ssf). This amount was then multiplied by the average pounds of lead per ssf produced (0.01).
d. For each size category, the average amount of lead per facility was estimated by dividing the amount of lead corresponding with that size category by the number of facilities in that category.

Semiconductors and Related Devices (SIC 3674)

Semiconductors are the basic material of various electronic devices used in computer technology, telecommunications, control systems, and other applications. Semiconductor manufacturing facilities use aluminum, gold, and recently, copper to create the conductive layers on the semiconductor device. These metals contain lead as a naturally-occurring impurity. Additionally, after the individual dies are cut from the silicon wafer, each die is attached to a frame. The frame is a formed copper strip, sometimes silver or palladium plated, comprising the die attachment surface and lead attachment points. The leads are made of aluminum or gold and are attached to the individual devices using a wire bonding process which may use a tin/lead solder.

In 1998, 5 facilities in this SIC code reported to TRI for lead or lead compounds. At the 1-, 10-, and 100-pound reporting thresholds, an additional 608 additional facilities are expected to report for lead and lead compounds. At the 1,000-pound reporting threshold, an additional 236 facilities are estimated to report. If the current *de minimis* exemption for lead and lead compounds were retained, the estimated number of additional reports would be reduced because the concentration of lead in some, but not all of the lead-containing materials used are below the current *de minimis* level.

TABLE A-46
SIC 3674: SEMICONDUCTORS AND RELATED DEVICE MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	439	7	35
10 to 19	134	7	102
20 to 49	142	7	242
50 to 99	96	7	522
100 to 249	88	7	1,222
250 to 499	60	7	2,622
500 to 999	48	7	5,247
1,000 or more	45	7	7,000 or more
Total	1052		

a. U.S. Bureau of the Census, 1996b.
b. Semiconductor Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that category.

Electronic Capacitors (SIC 3675)

Electronic capacitor manufacturers have several potential sources of lead and lead compound emissions. Capacitors are manufactured with a variety of dielectric and plate materials, of which, ceramic and glass materials contain lead. Additionally, tin/lead solder and plating materials contain lead and are used extensively in capacitor manufacture. Tin/lead mixtures typically range from 60/40 to 99/1. Quality control checks for solderability represent another possible source of lead and lead compound emissions.

In 1998, one capacitor manufacturer reported to TRI for lead or lead compounds. An additional 94 facilities are expected to report at the 1-, 10-, and 100-pound reporting thresholds. An additional 55 facilities are estimated to report at the 1,000-pound reporting threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would not be affected because the concentration of lead used in various applications exceeds the current *de minimis* level.

TABLE A-47
SIC 3675: ELECTRONIC CAPACITOR MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	25	17.4	87
10 to 19	20	17.4	252
20 to 49	19	17.4	600
50 to 99	14	17.4	1,296
100 to 249	20	17.4	3,036
250 to 499	12	17.4	6,516
500 to 999	5	17.4	13,041
1,000 or more	5	17.4	17,400 or more
Total	120		

a. U.S. Bureau of the Census, 1996b.
b. Electronic Capacitors Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that category.

Electronic Resistors (SIC 3676)

Electronic resistor manufacturers use lead in solder and tin/lead plating. Tin/lead mixtures typically range from 60/40 to 99/1.

In 1998, one resistor manufacturer reported to TRI for lead or lead compounds. An additional 84 facilities are expected to report at the 1-pound threshold, an additional 74 facilities are expected to report at the 10-pound reporting threshold, and an additional 30 facilities are expected to report at the 100-pound reporting threshold. No additional facilities are estimated to report at the 1,000-pound reporting threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would not be affected because the concentration of lead used in various applications exceeds the current *de minimis* level.

TABLE A-48
SIC 3676: ELECTRONIC RESISTOR MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	20	0.6	3
10 to 19	10	0.6	9
20 to 49	16	0.6	21
50 to 99	28	0.6	45
100 to 249	22	0.6	105
250 to 499	5	0.6	225
500 to 999	4	0.6	450
Total	105		

a. U.S. Bureau of the Census, 1996b.
b. Electronic Resistors Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that category.

Electronic Coils and Transformers (SIC 3677)

Lead is a trace contaminant in copper, which is often used in large quantities at electronic coil and transformer manufacturing facilities. Significant amounts of lead may also result from the use of solder in this industry. Tin/lead solder mixtures typically range from 60/40 to 99/1. Glass used in metal icing also contains lead.

In 1998, no facilities in this SIC code reported to TRI for lead or lead compounds. Two hundred and ninety-nine facilities are expected to report at the 1-, 10-, and 100-pound reporting thresholds, and 128 facilities are estimated to report at the 1,000-pound reporting threshold. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would not be affected because the concentration of lead in materials used in this sector typically exceeds the current *de minimis* level.

TABLE A-49
SIC 3677: ELECTRONIC COIL AND TRANSFORMER MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	140	15	75
10 to 19	67	15	218
20 to 49	104	15	518
50 to 99	70	15	1,118
100 to 249	48	15	2,618
250 to 499	9	15	5,618
500 to 999	1	15	11,243
Total	439		

a. U.S. Bureau of the Census, 1996.
b. Electronic Coils and Transformers Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee by the average number of employees in that category.

Electronic Connectors (SIC 3678)

Electronic connector manufacturers may use lead and lead compounds in solder paste, solder spheres, solder wire, or tin/lead plating. Tin/lead solder mixtures typically range from 60/40 to 99/1. Additionally, equipment operation and support frequently require the use of lead.

In 1998, one facility in this SIC code reported to TRI for lead or lead compounds. An additional 215 facilities are expected to report at the 1-, 10-, 100-, and 1,000-pound reporting thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, these estimates would not be affected because the concentration of lead used in various applications exceeds the current *de minimis* level.

TABLE A-50
SIC 3678: ELECTRONIC CONNECTOR MANUFACTURERS

Facility size by number of employees	Number of facilities [a]	Average lead per employee (lbs) [b]	Average lead per facility (lbs) [c]
1 to 9	93	168.2	841
10 to 19	25	168.2	2,439
20 to 49	61	168.2	5,803
50 to 99	37	168.2	12,531
100 to 249	54	168.2	29,351
250 to 499	29	168.2	62,991
500 to 999	7	168.2	126,066
1,000 or more	3	168.2	168,200 or more
Total	309		

a. U.S. Bureau of the Census, 1996b.
b. Electronic Connectors Industry Sources, 2000.
c. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee corresponding with that size category by the average number of employees in that category.

Electronic Components, n.e.c (SIC 3679)

Electronic components, not elsewhere classified, consists of manufacturers of a wide range of products such as piezoelectric devices, microwave components, transducers, switches, and printed circuit assemblies. With such variability in products, there are also great differences in the quantities of lead used per facility within this SIC code. Some uses of lead in this sector include tin/lead solder used in circuit board assembly and in general soldering operations, lead-based materials such as lead zirconate titanate used in piezoelectric products, and lead found in trace quantities in copper, zinc, gold and steel parts used in manufacturing other electronic components.

The Industry Source Method was used to estimate the number of lead reports expected from electronic component manufacturers due to lead processing. Because of the great variability of lead use in SIC 3679, the Industry Source information for this sector was divided into two groups. Facilities that use lead either because lead is a trace contaminant in other materials, or because use of materials containing lead is infrequent were classified as "low-use facilities." Facilities that process materials with higher lead concentrations, or process greater quantities of lead were considered "higher-use facilities." This distinction was made based on general background information on the different types of manufacturing operations in SIC 3679 and on information from industry sources. It was assumed that low-use facilities include: SIC 36791 (crystals, filers, piezoelectric, and other related devices); SIC 36793 (microwave components and devices); SIC 36795 (transducers, electrical/electronic input or output, n.e.c.); and SIC 36796 (switches, mechanical, for electronic circuitry). SIC 36798 (printed circuit board assemblies) were assumed to be higher-use facilities. For SIC 36799 (electronic components, n.e.c.), it was assumed that half of these facilities would be engaged in low-use operations and half in higher-use operations.

Information gathered from industry sources was used to estimate typical lead use per employee for the low-use applications. Facilities engaged in operations assumed to be "low-use" (SIC codes 36791, 36793, 36795, 36796, and half of 36799) account for 49 percent of the total number of facilities in SIC 3679 (U.S. Bureau of the Census, 1992). For the higher-use facilities, lead use per employee was estimated based on current reporting threshold of 25,000 pounds. It was assumed that facilities in SIC 3679 currently reporting for lead and lead compounds have 1,000 or more employees, and use 25,000 pounds or more of lead and lead compounds. Based on this assumption, it was estimated that higher-use facilities in SIC 3679 use 25 pounds of lead per employee. Facilities engaged in operations assumed to be "higher-use" (SIC codes 36798, and half of 36799) account for 51 percent of the total number of facilities in SIC 3679 (U.S. Bureau of the Census, 1992). For each employment size category, the amount of lead use per facility was estimated following the Industry Source method, as described for other sectors withing SIC 367. However, this estimation was done for each employment category using both the low-use and the high-use estimate of lead use per employee, as shown in Table A-51.

In 1998, 33 facilities in this SIC code reported to TRI for lead or lead compounds. An additional 1,683 facilities are expected to report at the 1- and 10-pound reporting thresholds. At the 100-pound reporting threshold, an additional 1,230 facilities are estimated to report, and at the 1,000-pound threshold, an additional 445 facilities are estimated to report for lead and lead compounds. If the current *de minimis* exemption for lead and lead compounds were retained, the estimated number of facilities reporting would be reduced because the concentration of lead used in some, but not all applications are below the current *de minimis* level.

TABLE A-51
SIC 3679: ELECTRONIC COMPONENTS MANUFACTURERS, N.E.C

Facility size by number of employees	Number of facilities in SIC 3679 [a]	Number of facilities with low-use operations [b]	Lead per facility for low-use facilities (lbs) [c]	Number of facilities with higher-use operations	Lead per facility for higher-use facilities (lbs) [c]
1 to 9	910	446	19	464	238
10 to 19	365	179	29	186	363
20 to 49	560	274	69	286	863
50 to 99	364	178	149	186	1,863
100 to 249	274	134	349	140	4,363
250 to 499	97	48	1,249	49	15,613
500 to 999	34	17	1,449	17	18,113
1,000 or more	22	11	2,000	11	25,000
Total	2,626	1,287	5,313	1,339	66,416

a. U.S. Bureau of the Census, 1996b.
b. U.S. Bureau of the Census, 1992. Facilities engaged in operations assumed to be "low-use" (SIC codes 36791, 36793, 36795, 36796, and half of 36799) account for 49% of the total number of facilities in SIC 3679.
c. Electronic Components Industry Sources, 2000. For each size category, the average amount of lead per facility was estimated by multiplying the amount of lead per employee corresponding with that size category by the average number of employees in that category.

TABLE A-52
SIC 3679: SUMMARY OF REPORTS

Facility size by number of employees	Number of facilities in SIC 3679 [a]	Number of facilities exceeding a threshold of:			
		1 lb.	10 lbs.	100 lbs.	1,000 lbs.
1 to 9	910	0	0	0	0
10 to 19	365	365	365	186	0
20 to 49	560	560	560	286	0
50 to 99	364	364	364	364	186
100 to 249	274	274	274	274	140
250 to 499	97	97	97	97	97
500 to 999	34	34	34	34	34
1,000 or more	22	22	22	22	22
Total	2,626	1,716	1,716	1,263	478

SIC 3691: Storage battery manufacturing

The manufacturing of batteries is the largest lead-consuming process in the United States, accounting for 87 percent of lead consumption in 1997. Lead compounds are used in batteries because of resistance to corrosiveness of sulfuric acid and low cost (USGS, 1998a). In lead-acid storage batteries, the structural grids and terminal posts are manufactured with lead alloys, while lead oxide paste is used to make the charge-carrying plates (U.S. EPA, 1998a).

The Lead Production/Consumption Method was used to estimate the number of lead reports for SIC 3691. The U.S. Geological Survey reported total lead consumption of three billion pounds for storage battery manufacturing in 1997 (USGS, 1998a). This analysis assumes that total lead consumption was proportional to the cost of materials for each employment size class (U.S. Bureau of the Census, 1992). The total amount of lead for each employment size class was estimated by multiplying the total lead consumption by the percent of cost of materials for that employment size class. For each employment size class, the average amount of lead per facility was calculated by dividing the amount of lead corresponding with that size class by the number of facilities in that class (see Table A-53).

In 1998, 70 facilities in SIC 3691 reported to TRI for lead because their lead use exceeds current thresholds. An additional 28 facilities in SIC 3691 are estimated to submit TRI reports for lead and lead compounds at each of the four lower thresholds. If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from this SIC code would not be affected because the concentration of lead exceeds the current *de minimis* level.

TABLE A-53
SIC 3691: STORAGE BATTERY MANUFACTURING

Facility size by number of employees [a]	Number of facilities [b]	Cost of materials [c] (million $)	Estimated percent of industry activity	Amount of lead [d] (million lbs)	Average amount of lead per facility [e] (million lbs)
1 to 9	43	10.4	0.6%	19.5	0.45
10 to 19	8	10.7	0.7%	20.1	2.51
20 to 49	16	29.1	1.8%	54.6	3.41
50 to 99	16	79.8	4.9%	149.7	9.36
100 to 249	25	350.1	21.4%	657	26.3
250 to 499	28	959.2	58.7%	1,800	64.3
500 to 2,499	5	194.1	11.9%	364	72.8
Total	141	1,633.4	100.0%	3,065	

a. Some employee categories were combined because of combined facility data.
b. U.S. Bureau of the Census, 1996b.
c. U.S. Bureau of the Census, 1992.
d. USGS, 1998a. It was assumed that production was proportional to the cost of materials for each facility size class.
e. For each facility size class, the average amount of lead was estimated by dividing the amount of lead corresponding with that size class by the number of facilities in that class.

SIC 371: Motor vehicles and motor vehicle equipment

Motor vehicle and motor vehicle equipment manufacturers (SIC 371) use lead in numerous applications, including casting metals, terne metal, solder, automotive coverings, air bag propellants, wheels and wheel components, radiators, fuel tanks, engines, and battery cables and posts (U.S. EPA, 1998a; Wagner Brakes, 2000; Federal Mogul, 2000). Motor vehicle and motor vehicle equipment manufacturers use alloys such as brass and steel which contain lead, and metals such as aluminum and copper which contain lead as an impurity. Lead alloys are used in bearing metals, shock absorbers, and brake linings to obtain desired properties related to friction, wear, compatibility, fatigue, compressive strength, and corrosion resistance (Kirk-Othmer, 1998).

The Industry Source Method was used to estimate the number of lead reports expected from SIC 371 due to lead processing. Information gathered from several industry sources was used to estimate typical lead use in motor vehicle and motor vehicle equipment manufacturing. In cases where data were not available on the number of facilities per manufacturing operation, this analysis assumed that facilities with shipments of $100,000 or more have 10 or more employees.

This analysis does not include estimates of lead included in bearing assembly and storage batteries because it is assumed that these products are covered by the article exemption. The number of reports may be underestimated because sufficient data were not available to estimate reports due to lead use in brake components, automotive coverings, and air bag propellants or due to trace amounts of lead in steel.

Fuel Tank Manufacturing (SIC 3714903)

Terne metal and tin-lead solder are used to manufacture fuel tanks. The concentration of lead in both terne metal and solder is 20/80, tin/lead (Sun Wallpaper and Paint, 2000; U.S. EPA, 1991). Terne metal (a lead alloy laminated onto a steel sheet) is used in fuel tank manufacture because it is corrosion-resistant, even when dented (U.S. EPA, 1991). In 1997, 15 facilities with shipments of $100,000 or more manufactured fuel tanks. Based on the value of shipments and the number of fuel tank manufacturers, it was estimated that each facility produced an average of 1.66 million fuel tanks in 1997 (U.S. Bureau of the Census, 1997). Using this production estimate, it was determined that each fuel tank would have to contain at least 0.0007 pounds of lead in order for a facility to exceed the 1,000-pound reporting threshold. Because of the high concentration of lead in the materials used, it was assumed that each fuel tank contains at least this amount of lead, and therefore, that each facility uses at least 1,000 pounds of lead per year.

Aluminum Wheels (SIC 3714705)

Aluminum alloys are used to manufacture transmission housings, manifolds, cylinders, pistons, brake drums and rotors, aluminum wheels, and engine parts (Aluminum Association, 2000a; Ducker Research Company, 1998; Ducker Research Company, 2000). According to sampling data from Aluminum Association members, the lead concentration in alloyed and unalloyed aluminum is normally in the 0.001% - 0.01% range. However, concentrations may be as high as 0.02%. This analysis assumes alloyed and unalloyed aluminum have an typical lead concentration of 0.01%. Based on the number of facilities, the value of product shipments, and estimates of wheel prices, wheel weight, type of alloy used, and percent of lead in aluminum. In 1997, 23 facilities with shipments of $100,000 or more manufactured aluminum wheels (U.S. Bureau of the Census, 1997). The value of shipments per facility was determined by dividing the value of shipments for SIC code 3714705 ($1,655,098,000; U.S. Bureau of the Census, 1997) by the number of facilities with shipments of $100,000 or more. The number of wheels manufactured per facility was estimated to be 359,804 by dividing the value of shipments per facility by the average price per wheel ($200; Motor Vehicle Industry Sources, 2000). The amount of lead per facility was calculated by multiplying the number of wheels manufactured per facility by the weight per wheel (15 pounds; Motor Vehicle Industry Sources, 2000) by the percent of aluminum in the aluminum alloy (93%; Motor Vehicle Industry Sources, 2000) by the percent of lead in the aluminum (0.01%; Aluminum Association, 2000b). Based on this information, it was estimated that each of these facilities uses more than 100 pounds and less than 1,000 pounds of lead per year.

Engines and Engine Parts (SIC 37142)

Lead is found in trace amounts in the aluminum used in the manufacture of engines and engine parts. Three hundred and fifty-eight facilities with 10 or more employees manufacture engines and engine parts (U.S. Bureau of the Census, 1997). There was not enough data to estimate the amount of aluminum used in the manufacture of engines and engine parts. Because aluminum is the source of lead in both SIC codes 37142 and 3714705, this analysis assumes that facilities in SIC code 37142 use the same order of magnitude of lead as that used by facilities in SIC code 3714705. Therefore, it is estimated that each facility would use more than 100 pounds and less than 1,000 pounds of lead per year.

Radiator Manufacturing (SIC 3714235)

Motor vehicle radiators are made of aluminum and copper/brass. Lead occurs as an impurity in aluminum, copper, and brass (copper-zinc). The concentration of lead in aluminum is approximately 0.010 % (Aluminum Association, 2000b), the concentration of lead in copper is less than 1% (USGS, 1999d), and the concentration of lead in brass is variable due to the addition of various amounts of lead as an intended component of the alloy. Tin-lead solder (20/80, tin/lead) is also used in copper/brass radiator manufacturing (U.S. EPA, 1991). The National Automotive Radiator Service Association (NARSA) estimates that there are twelve large manufacturers and several hundred small manufacturers of radiators. In 1997, 53 facilities with shipments of $100,000 or more manufactured radiators (U.S. Bureau of the Census, 1997). While aluminum, copper, and brass are sources of lead in radiator manufacture, sufficient information was not available to include these sources in this estimate. This analysis only estimates lead use due to solder. Approximately 1 pound of solder (0.8 pounds of lead) is used per car radiator, and approximately 2 pounds of solder (1.6 pounds of lead) are used per truck radiator (U.S. EPA, 1991). Therefore, each facility must manufacture 1,250 car radiators in order to exceed the 1,000-pound reporting threshold. The value of radiator shipments ($1.5 billion; U.S. Bureau of the Census, 1997) was used to determine that each facility is expected to exceed this production level. Therefore, it was estimated that each facility would use at least 1,000 pounds of lead per year.

Summary of additional reports for SIC 371

In 1998, 102 facilities in SIC 371 reported to TRI for lead or lead compounds. This analysis assumes that all 102 reports from SIC 371 are attributable to the specific 5- and 7-digit SIC codes analyzed. An additional 347 facilities in SIC 371 are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, and 100-pound thresholds. No additional reports are expected at the 1,000-pound threshold.

If the current *de minimis* exemption for lead and lead compounds were retained, it is likely that the number of additional reports for SIC 371 would be reduced, since the concentration of lead in aluminum is below the current *de minimis* level. However, the number of reports resulting from lead in copper and solder would not be affected because these concentrations exceed the current *de minimis* level.

TABLE A-54
SIC 371: MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT

Product	Number of facilities with greater than 10 employees reporting for:			
	1 lb	**10 lbs**	**100 lbs**	**1,000 lbs**
Fuel tanks	15	15	15	15
Aluminum wheels	23	23	23	0
Engines and engine parts	358	358	358	0
Radiators	53	53	53	53
Total reports	449	449	449	68
Current reports	102	102	102	102
Total additional reports	347	347	347	0

Part of SIC 3931: Organ manufacturing

Organbuilders process lead in the pipes and solder used in the manufacture of musical organs. According to the American Institute of Organbuilders, approximately 75 percent of organ manufacturing facilities produce their own organ pipes. Production involves cutting and rolling a sheet of pipe alloy into the desired form and soldering a joint the length of the pipe. The pipe is then cut and shaved to achieve the required size and sound characteristics. The remaining 25 percent of organ manufacturing facilities do not produce their own pipes. Rather, they purchase their organ pipes from a pipe manufacturer. Purchased pipes are also cut and shaved to achieve the required size and sound characteristics. The concentration of lead in organ pipes ranges from 50 to 98 percent, with the average lead concentration estimated to be 80 percent. The solder used in organ manufacture is eutectic solder with a tin/lead ratio of 63/37 (American Institute of Organbuilders, 2000a).

Organ manufacturing facilities are found in SIC code 39312 (Organs). There are 47 organ manufacturing facilities in the U.S. (U.S. Bureau of the Census, 1992). Approximately 30 of these facilities are estimated to have 10 or more employees (American Institute of Organbuilders, 2000b). According to 1998 TRI data, no facilities in SIC 3931 currently report for lead or lead compounds.

The Industry Source method was used to estimate the number of lead reports for organ manufacturing facilities. The annual lead use for an organ manufacturing facility with 10 employees is estimated to be 2,784 pounds (American Institute of Organbuilders, 2000a). This analysis assumes that this estimate is representative of the industry and, therefore estimates that all 30 organbuilding facilities with 10 or more employees are expected to exceed the 1-, 10-, 100-, and 1,000-pound reporting thresholds (see Table A-55). If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports would not be affected because the concentration of lead exceeds the current *de minimis* level.

TABLE A-55
SIC 39312: ORGAN MANUFACTURING

Number of facilities with 10 or more employees [a]	Annual lead usage for a facility with 10 employees [b]	Number of facilities exceeding the 1-, 10-, 100-, and 1,000-lb thresholds
30	2,784 lbs	30

a. American Institute of Organbuilders (2000b).
b. American Institute of Organbuilders (2000a). An organbuilding facility of 29 employees is known to have used 8,074 lbs of lead in 1999. Based on this information, an estimate of annual lead use per employee was estimated and assumed to be representative of the industry.

SIC 4953: Refuse systems

To estimate the number of commercial hazardous waste treatment facilities that may report on lead and lead compounds at lower reporting thresholds, data on off-site transfers from TRI facilities in 1998 were used (Abt Associates, 2000). The TRI data have certain limitations when used for this purpose. First, TRI data may underestimate the *number of reporting facilities* because TRI-subject hazardous waste facilities that receive wastes only from non-TRI facilities would not appear in TRI. Second, the TRI data may underestimate the *amount of the chemical* because it does not include transfers that the hazardous waste facility may receive from non-TRI facilities, or transfers from TRI facilities for chemicals that did not exceed current reporting thresholds.

Therefore, for this analysis, each facility was assumed to represent two facilities, and the amount transferred was doubled to account for additional quantities not captured under current TRI reporting. TRI data for the 1998 reporting year indicates that 55 facilities reported on lead or lead compounds at current thresholds. Using this methodology, all of the remaining 107 facilities are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound thresholds (see Table A-56).

TABLE A-56
SIC 4953: REFUSE SYSTEMS

Threshold	Estimated number of lead reports		
	Total number of reports (current + additional)	Current number of facilities reporting	Additional number of reports
1 lb	162	55	107
10 lbs	162	55	107
100 lbs	162	55	107
1,000 lbs	162	55	107

SIC 5171: Bulk Petroleum

Petroleum bulk stations and bulk terminals process lead as a trace constituent in crude oil, No. 2 distillate fuel oil, No. 6 residual fuel oil, gasoline, and aviation gas (U.S. EPA, 1997a). The number of petroleum bulk stations and terminals that may submit additional TRI reports for lead and lead compounds at a lower reporting threshold were estimated by the following procedure:

- Select a typical lead concentration in each of the petroleum products;
- Determine the percentage of total reportable facilities (i.e., ten or more employees) handling each petroleum product containing a trace lead constituent;
- Using six model facilities for bulk stations and terminals, determine the amount of lead for each model facility by petroleum product;
- Apply the percentage of facilities handling each petroleum product to the number of facilities represented by each model;
- For each model, determine the minimum number of facilities expected to submit a report at each threshold by assuming a single facility handles all petroleum products with a trace lead constituent (i.e., if a model exceeds a reporting threshold for crude, No. 2, and No. 6 fuel oil, one facility would submit a single report that accounts for the lead present in all three petroleum products);
- For each model, determine the maximum number of facilities expected to submit a report at each threshold by assuming a single facility only handles one petroleum product with a trace lead constituent (i.e., if a model exceeds a reporting threshold for crude, No. 2, and No. 6 fuel oil, three separate facilities would submit additional reports for lead); and
- Determine the total number of facilities expected to report at each lower reporting threshold by adding the results for each model facility.

Typical concentrations of lead are 0.31 ppm in crude oil, 0.5 ppm in No. 2 fuel oil, 1 ppm in No. 6 fuel oil, 0.079 ppm in gasoline, and 1,750 ppm in aviation gas (all based on weight) (Valkovic, 1978; U.S. EPA, 1998a; ASTM, 1997). If the current *de minimis* exemption for lead and lead compounds were retained, the number of additional reports from this SIC code would be reduced because these concentrations are below the current *de minimis* level.

According to the *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313*, there are 3,842 facilities in SIC 5171 subject to TRI reporting (i.e., have 10 or more employees) (U.S. EPA, 1997a). Each bulk station or terminal may not handle all petroleum products. An analysis of 309 facilities in SIC 5171 reported the estimated percentage of total facilities handling each petroleum product: 32 percent handle No. 6 fuel oil; 13 percent handle crude oil; and 55 percent handle No. 2 fuel oil. The 2,113 facilities (55% × 3,842) handling No. 2 fuel oil may or may not also handle No. 6 fuel oil and crude oil. If the 2,113 facilities handle all three products, the number of facilities subject to TRI reporting for lead at a lower threshold and *de minimis* concentration would be 2,113 facilities. However, if each product is handled by separate facilities, 2,113 facilities would handle No. 2 fuel oil; 1,229 facilities (32% × 3,842) would handle No. 6 fuel oil; and 499 facilities (13% × 3,842) would handle crude oil; this sums to 3,842 facilities. Therefore, the maximum number of facilities subject to TRI reporting for lead at a lower threshold would be 3,842 facilities.

To determine the number of facilities that may submit additional TRI reports for lead and lead compounds at the lower reporting thresholds, the model facilities, and their corresponding annual product throughput estimates listed in the *Economic Analysis of the Final Rule to Add Certain Industry Groups to EPCRA Section 313* were used (U.S. EPA, 1997a). Table A-57 reproduces Table H-2 of the industry expansion economic analysis which presents the annual throughputs and number of facilities represented by the model.

TABLE A-57
ANNUAL THROUGHPUT ESTIMATES AND TOTAL NUMBER OF FACILITIES BY SIC CODE 5171 MODEL FACILITIES

Product	Annual Throughput for Each Model Facility Size Category (1,000 gallons/year)					
	1	**2**	**3**	**4**	**5**	**6**
Gasoline	3,750	5,100	34,500	85,000	170,000	340,000
No. 6 Fuel Oil	45	61	4,809	12,022	24,045	48,090
Crude Oil	371	505	17,862	44,655	89,317	178,623
No. 2 Fuel Oil	1,665	2,264	11,166	27,916	55,832	111,665
Lubricating Oils	156	213	176	441	883	1,767
Aviation Gas	17	24	161	404	808	1,616
Jet Fuel	45	62	2,738	6,847	13,694	27,389
Total Number of Facilities	**1,906**	**558**	**551**	**317**	**372**	**138**

Source: U.S. EPA, 1997a
Notes: No throughput is estimated for additives. Annual throughput for each product was calculated by multiplying the daily throughput by 340 days for bulk terminals and 300 days for bulk plants. Model facility throughputs for each product type were calculated separately; this does not mean that each model facility handles all seven petroleum products. Estimates of the number of facilities and annual throughput for gasoline are based on "Model Plants" described in U.S. EPA, 1997a. Model Facility 1 and 2 are based on Model Plant Numbers 4 and 5, respectively, in the Background Information document. Model Facilities 3, 4, 5, and 6 are based on Model Terminal Numbers 1 through 4.

Using the annual model throughputs above for each fuel type known to contain lead and lead compounds, the amount of lead processed through each model facility was determined. The number of facilities represented by each model above that handle these fuels was determined using the appropriate percentages. Table A-57 presents the results for this analysis; a sample calculation is shown below.

Sample calculation for annual lead throughputs for Model Facility 6:

No. 2 fuel oil: (111,665,000 gal oil/yr) × (7.3 lb oil/ gal oil) × (0.5 lb lead/10^6 lb oil)
= 408 lbs lead/yr
No. 6 fuel oil: (48,090,000 gal oil/yr) × (8 lb oil/ gal oil) × (1 lb lead/10^6 lb oil)
= 385 lbs lead/yr
Crude oil: (178,623,000 gal oil/yr) × (8.345 lb oil/ gal oil) × (0.31 lb lead/10^6 lb oil)
= 462 lbs lead/yr
Gasoline: (340,000,000 gal gas/yr) × (8.345 lb gas/ gal gas) × (0.079 lb lead/10^6 lb gas)
= 224 lbs lead/yr
Av. Gas: (1,616,000 gal gas/yr) × (8.345 lb av. gas/ gal gas) × (1,750 lb lead/10^6 lb gas)
= 23,594 lbs lead/yr

Number of facilities represented by Model Facility 6 that handle each product:

Gasoline:	64% × 138 = 88
No. 2 fuel oil:	55% × 138 = 76
No. 6 fuel oil:	32% × 138 = 44
Crude oil:	13% × 138 = 18
Aviation gas:	4% × 138 = 6

For Model Facility 6, lead quantities in all five petroleum products exceed the 1-, 10-, and 100-pound thresholds. The minimum number of facilities expected to submit additional TRI reports equals the 88 facilities handling gasoline, assuming the same facilities also handle No. 6 fuel, No. 2 fuel oil, aviation gas, and crude oil. The maximum number of facilities expected to submit additional TRI reports equals the maximum number of facilities represented by Model Facility 6, assuming some facilities handle multiple petroleum products while others handle a single petroleum product. The maximum number is then equal to 138 facilities.

At a reporting threshold of 1,000 pounds per year, only the processing of aviation gas at Model Facility 6 facilities is expected to exceed the threshold for lead. Therefore, the minimum and maximum number of facilities expected to submit additional TRI reports at the 1,000-lb reporting threshold equals the six facilities handling aviation gas.

In 1998, five facilities reported on lead and lead compounds. For each of the lower reporting thresholds, the total range of facilities that may submit additional TRI reports for lead was determined by adding the results for each of the models (see Tables A-59a, A-59b, and A-60). A range was generated because development of a point estimate was not possible. This range presents a best estimate and a maximum number of reports. For the purposes of the cost analysis, the best estimate of the number of reports is used. An additional 2,454; 975; 616; and 50 facilities are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound thresholds, respectively.

TABLE A-58
ESTIMATED LEAD USAGE FOR SIC CODE 5171 MODEL FACILITIES

Model				Lead Analysis		
Model Facility Number	**Number of Facilities**	**Fuel Type**	**Annual Throughput (10^3 gal/yr)**	**% of Facilities Handling Each Fuel Type**	**Facilities Handling Each Fuel**	**Estimated Lead Throughput Per Facility (lb/yr)**
1	1,906	No. 2 Fuel Oil	1,665	55%	1,048	6
		No. 6 Fuel Oil	45	32%	610	0
		Crude Oil	371	13%	248	1
		Gasoline	3,750	64%	1,220	2
		Aviation Gas	17	4%	76	248
2	558	No. 2 Fuel Oil	2,264	55%	307	8
		No. 6 Fuel Oil	61	32%	179	0
		Crude Oil	505	13%	73	1
		Gasoline	5,100	64%	357	3
		Aviation Gas	62	4%	22	350
3	551	No. 2 Fuel Oil	11,166	55%	303	41
		No. 6 Fuel Oil	4,809	32%	176	38
		Crude Oil	17,862	13%	72	46
		Gasoline	34,500	64%	353	23
		Aviation Gas	2,738	4%	22	2,351
4	317	No. 2 Fuel Oil	27,916	55%	174	102
		No. 6 Fuel Oil	12,022	32%	101	96
		Crude Oil	44,655	13%	41	116
		Gasoline	85,000	64%	203	56
		Aviation Gas	6,847	4%	13	5,898
5	372	No. 2 Fuel Oil	55,832	55%	205	204
		No. 6 Fuel Oil	24,045	32%	119	192
		Crude Oil	89,317	13%	48	231
		Gasoline	170,000	64%	238	112
		Aviation Gas	13,694	4%	15	11,797
6	138	No. 2 Fuel Oil	111,665	55%	76	408
		No. 6 Fuel Oil	48,090	32%	44	385
		Crude Oil	178,623	13%	18	462
		Gasoline	340,000	64%	88	224
		Aviation Gas	27,389	4%	6	23,549

TABLE A-59a
SIC 5171: PETROLEUM BULK STATIONS AND TERMINALS

Lead threshold	Estimated reports due to gasoline [a]	Estimated reports due to residual oil [a]	Estimated reports due to distillate oil [a]	Estimated reports due to crude oil [a]	Estimated reports due to aviation gas [a]
1 lb	2,459	441	2,113	252	154
10 lbs	882	441	758	179	154
100 lbs	326	163	455	108	154
1,000 lbs	0	0	0	0	55

TABLE A-59b
SIC 5171: PETROLEUM BULK STATIONS AND TERMINALS

Lead threshold	Minimum estimated number of reports [b]	Maximum estimated number of reports [c]
1 lb	2,459	3,842
10 lbs	980	2,414
100 lbs	621	1,206
1,000 lbs	55	55

a. Lead concentrations for the different fuel types were applied to six different model facility size categories. See the Table A-60 for a more detailed breakdown.
b. The minimum estimated number of reports assumes maximum overlap of facilities that process more than one fuel type.
c. The maximum estimated number of reports assumes minimum overlap of facilities that process more than one fuel type.

TABLE A-60
SIC 5171: PETROLEUM BULK STATIONS AND TERMINALS
ESTIMATES BASED ON MODEL FACILITY SIZE CATEGORIES

Type of fuel processed	Model facility size category 1	2	3	4	5	6	Subtotal	Total minimum number of facilities [a]	Total maximum number of facilities [a]
1 lb threshold								2,459	3,842
Gasoline	1,220	357	353	203	238	88	2,459		
No. 6 residual fuel oil	0	0	176	101	119	44	441		
No. 2 distillate fuel oil	1,048	307	303	174	205	76	2,113		
Crude oil	0	73	72	41	48	18	252		
Aviation gas	76	22	22	13	15	6	154		
Minimum number of facilities possibly filing on lead	1,220	357	353	203	238	88	2,459		
10 lb threshold								980	2,414
Gasoline	0	0	353	203	238	88	882		
No. 6 residual fuel oil	0	0	176	101	119	44	441		
No. 2 distillate fuel oil	0	0	303	174	205	76	758		
Crude oil	0	0	72	41	48	18	179		
Aviation gas	76	22	22	13	15	6	154		
Minimum number of facilities possibly filing on lead	76	22	353	203	238	88	980		
100 lb threshold								621	1,206
Gasoline	0	0	0	0	238	88	326		
No. 6 residual fuel oil	0	0	0	0	119	44	163		
No. 2 distillate fuel oil	0	0	0	174	205	76	455		
Crude oil	0	0	0	41	48	18	108		
Aviation gas	76	22	22	13	15	6	154		
Minimum number of facilities possibly filing on lead	76	22	22	174	238	88	621		
1,000 lb threshold								55	55
Gasoline	0	0	0	0	0	0	0		
No. 6 residual fuel oil	0	0	0	0	0	0	0		
No. 2 distillate fuel oil	0	0	0	0	0	0	0		
Crude oil	0	0	0	0	0	0	0		
Aviation gas	0	0	22	13	15	6	55		
Minimum number of facilities possibly filing on lead	0	0	22	13	15	6	55		

a. Range estimated based on the fact that not all establishments handle all products. For example, for Model Facility 3, 176 facilities may handle No. 6 fuel oil and crude oil, or 176 facilities handling No. 6 fuel oil plus 72 facilities handling crude oil equals 248 total facilities.

Solvent recovery services (SIC 7389)

To estimate the number of solvent recovery facilities that may report on lead and lead compounds at lower reporting thresholds, data on off-site transfers from TRI facilities in 1998 were used (Abt Associates, 2000). The TRI data have certain limitations when used for this purpose. First, TRI data may underestimate the *number of reporting facilities* because TRI-subject solvent recovery facilities that receive wastes only from non-TRI facilities would not appear in TRI. Second, the TRI data may underestimate the *amount of the chemical* because it does not include transfers that the solvent recovery facility may receive from non-TRI facilities, or transfers from TRI facilities for chemicals that did not exceed current reporting thresholds.

Therefore, for this analysis, each facility was assumed to represent two facilities, and the amount transferred was doubled to account for additional quantities not captured under current TRI reporting. In 1998, two facilities reported on lead or lead compounds at current thresholds. An additional 108, 96, 78, and 40 facilities are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound thresholds, respectively (see Table A-61).

TABLE A-61
SIC 7389: SOLVENT RECOVERY SERVICES

	Estimated number of lead reports		
Threshold	Total number of reports (current + additional)	Current number of reports	Additional number of reports
1 lb	110	2	108
10 lbs	98	2	96
100 lbs	80	2	78
1,000 lbs	42	2	40

SIC 20–39, 4911, 4931, 4939: Combustion in manufacturing facilities and electric utilities

The approach used to estimate the number of manufacturing facilities (SIC 20-39) and electric utilities (SIC 4911, 4931, and 4939) that are expected to exceed the lower TRI reporting thresholds for lead and lead compounds as a result of fuel usage is described below:

- Determine typical concentrations for lead in the various fuels,
- Calculate the minimum annual throughput of various fuels needed to exceed each of the lower thresholds,
- Estimate the percentage of facilities that burn enough fuel to exceed the threshold for lead, and

- Estimate the total number of facilities expected to submit reports at each of the lower reporting thresholds.

The number of manufacturing facilities estimated to report due to combustion may represent an overestimate, as facilities may already report for lead or lead compounds at current reporting thresholds as a result of other non-combustion activities. For example, using the methodology outlined above, a facility in SIC Code 32 (Stone, clay, glass, and concrete products) may be predicted to submit a report as a result of fuel combustion. However, this facility may be one of the 81 facilities that currently report to TRI as a result of other, non-combustion activities involving lead or lead compounds.

A description of the steps outlined above is provided in the following subsections.

Typical Lead Concentrations in Various Fuels

Table A-62 shows the various fuels used by facilities, the typical concentration of lead in each fuel type, and the fuel amounts needed to exceed the lower reporting thresholds. A range of chemical concentrations is possible depending on the source of the fuel. Typical concentrations provided in the literature were selected to obtain realistic estimates of additional reports (U.S. EPA, 1998a;1998e). A lead concentration of 111 ppm was used in the analysis of the number of reports expected from coal mining activities (SIC 12), however, data specific to coal combustion report a lead concentration of 14 ppm (0.030 lb/ton). The analysis below uses the combustion-specific concentration.

No additional reporting due to natural gas combustion is expected at the lower reporting threshold options for lead and lead compounds. For the economic analysis of the proposed rule, EPA consulted two sources for information on lead in natural gas: *Locating and Estimating Air Emissions from Lead and Lead Compounds* (EPA, 1998a) and *Study of HAP Emissions from Electric Utility Steam Generating Units -- Final Report to Congress* (EPA, 1998e). These sources provided emission factors for lead from natural gas combustion based on a very limited number of observations. The observed emissions of lead did not necessarily indicate that lead was present as a trace contaminant in natural gas. For example, the lead measured in emissions from natural gas combustion may have originated from the delivery system (solder in plumbing and pipes) and/or oil residues in combined-cycle combustion units. In this case, additional reporting would already be estimated from lead levels in residual or distillate fuel oil.

As a result of public comments on this issue, EPA sought additional information to verify if lead is found as a contaminant in natural gas. EPA located a report by the Gas Research Institute that characterizes the presence of hazardous air pollutants in natural gas (Chao, 1999). In this report, lead was not detected at a detection limit of 0.9 micrograms per cubic meter of natural gas. If lead were present at the detection limit concentration, a facility at the 90th percentile of manufacturing facilities using natural gas would only have a lead throughput of 0.05

lbs/year based on natural gas throughput data from the Industrial Combustion Coordinated Rulemaking (ICCR) database (U.S. EPA, 1998f). Because the recent data on trace levels of lead and lead compounds in natural gas indicate that very few facilities, if any, would be affected by any of the lower reporting threshold options, no additional reports are predicted to be submitted solely as a result of natural gas combustion.

TABLE A-62
ESTIMATED QUANTITY OF FUEL THROUGHPUT REQUIRED TO EXCEED LOWER REPORTING THRESHOLDS

Fuel Type	Concentration of Lead [a]	Fuel Amounts to Exceed Lower Reporting Thresholds [b]			
		1 lb	10 lbs	100 lbs	1,000 lbs
Coal (tons)	0.030 lb/ton	33 tons	332 tons	3,315 tons	33,154 tons
Residual Oil (bbl)	0.00033 lb/bbl	3,030 bbl	30,301 bbl	303,008 bbl	3,030,077 bbl
Distillate Oil (bbl)	0.000165 lb/bbl	6,060 bbl	60,602 bbl	606,015 bbl	6,060,153 bbl
Wood Waste (tons)	0.043 lb/ton	23 tons	232 tons	2,321 tons	23,208 tons

a. Adjusted to account for formation of the metal oxide.
b. Note: due to rounding, calculations may not yield exact numbers.

Fuel Usage Required to Exceed Reporting Thresholds

Once the concentration of lead in a fuel is determined, estimating the amount of fuel required to exceed a reporting threshold is straightforward, requiring a simple set of calculations. Table A-63 provides a list of conversion factors used in the calculations throughout this Appendix.

TABLE A-63
CONVERSION FACTORS USED TO CALCULATE
FUEL THROUGHPUTS

Parameter	Calculation Data
Density of Residual Oil:	7.3 lbs/gallon (0.876 kg/L)
Density of Distillate Oil :	7.3 lbs/gallon (0.876 kg/L)
Energy Content of Distillate Oil:	139,000 Btu/gallon
Ton:	2,000 lbs
Barrel:	42 gallons (petroleum, U.S.)
Kilogram:	2.2 pounds
Gallon:	3.785 liters
1 ppm (solid):	1 mg/kg
1 ppm (liquid):	1 mg/L
1 ppm (gas):	1 microgram/cubic meter
1 microgram/cubic meter:	62.43 x 10^{-9} lbs/1,000 cubic feet

As an example, the following calculation shows the procedure used to estimate the amount of coal needed to reach the lower reporting thresholds for lead, based on a lead concentration of 14 ppm in coal. For lead, combustion results in the manufacture of lead oxide (PbO). Since the metal oxide is heavier than the parent metal, the manufacturing threshold for metal compounds will be exceeded before the otherwise use threshold for the parent metal (i.e., less fuel is required to reach the threshold for the metal compound as compared to the parent metal). To estimate the amount of each fuel type required to reach the current thresholds, a factor was applied to the calculation to account for the manufacture of metal oxides. For lead, the factor is 0.928 based on the molecular weight ratio of Pb to PbO (207.2/223.2).

Sample calculation for coal:

1 lb threshold: (1,000,000 mg/kg) x (1/14 mg/kg) x (1 ton/2,000 lbs) / .928 = 33 tons coal
10 lb threshold: 33 tons coal x 10 = 332 tons coal
100 lb threshold: 33 tons coal x 100 = 3,315 tons coal
1,000 lb threshold: 33 tons coal x 1,000 = 33,154 tons coal

Estimation of Reporting from Manufacturing Facilities

To determine the percentage of manufacturing facilities burning sufficient fuel to exceed the 1-, 10-, 100-, 1,000-, and 10,000-pounds/year reporting thresholds, this analysis used the Industrial Combustion Coordinated Rulemaking (ICCR) database created by EPA in 1998 (U.S. EPA, 1998f). The ICCR database is a combustion unit inventory database that contains information on industrial and commercial combustion sources. The ICCR database includes information from EPA and state electronic databases, most importantly the EPA Aerometric Information Retrieval System (AIRS) and the Ozone Transport Assessment Group (OTAG) databases. In addition, 17 state databases were merged into the ICCR database. In merging these various databases, care was given not to enter duplicate records for any facility or combustion unit.

The ICCR database does not include information to determine the actual amount of fuel throughput for every facility. While approximately 60 percent of the boiler-specific records contain a fuel flow rate or operating rate that can be used as fuel throughput, the other 40 percent do not have this information. For records without flow rate or operating rate information, fuel throughput was estimated using the design capacity and operating hours. Since approximately 20 percent of boilers in the ICCR database burn multiple fuels, individual fuel throughput is overestimated for these records. The fuel throughputs for each boiler at a given facility burning a given fuel type were summed to determine the facility level fuel usage in a given fuel type. Table A-64 summarizes the ICCR information for manufacturing facilities, including maximum fuel throughput and the number of facilities by decile. Using the ICCR data and the fuel throughput information in Table A-65, the percentage of facilities using the minimum fuel throughput needed to exceed each reporting threshold was estimated. The percentage was estimated by counting the number of facilities with annual fuel throughputs greater than the minimum and dividing by the total number of facilities. Table A-65 summarizes the percentage of facilities exceeding each reporting threshold by fuel type.

TABLE A-64
FUEL THROUGHPUT OF MANUFACTURING FACILITIES

Decile	Coal		Distillate Oil		Residual Oil		Wood	
	Maximum Throughput (tons)	Number of Facilities	Maximum Throughput (barrels)	Number of Facilities	Maximum Throughput (barrels)	Number of Facilities	Maximum Throughput (tons)	Number of Facilities
10	2,540,304	68	17,937,143	262	11,033,244	212	7,356,002	140
9	139,170	68	104,836	262	215,467	212	153,921	140
8	69,855	68	50,139	262	105,595	213	55,787	140
7	39,900	68	19,739	262	63,556	213	27,894	140
6	24,393	68	8,205	262	35,200	213	18,537	140
5	15,470	68	3,646	262	17,690	213	13,283	141
4	7,014	68	1,405	263	9,119	213	6,833	141
3	2,218	68	548	263	3,929	213	3,213	141
2	388	68	187	263	976	213	1,300	141
1	25	69	21	263	36	213	103	141
TOTAL		**681**		**2,624**		**2,128**		**1,405**

TABLE A-65
PERCENTAGE OF MANUFACTURING FACILITIES WITH FUEL COMBUSTION ACTIVITIES EXCEEDING LOWER THRESHOLDS FOR LEAD BY FUEL TYPE

Fuel Type	**Percentage of Facilities Exceeding Lower Reporting Thresholds**			
	1 lb	**10 lbs**	**100 lbs**	**1,000 lbs**
Coal	88.5%	80.6%	67.0%	34.5%
Residual Oil	72.2%	42.1%	6.4%	0.2%
Distillate Oil	44.3%	17.0%	1.6%	0.1%
Wood Waste	92.1%	88.8%	74.4%	36.4%

To determine the number of facilities that burn sufficient fuel to reach each threshold, the percentage of facilities burning the minimum amount of fuel, determined from the ICCR database, was applied to the total number of facilities using each fuel obtained from the 1994 Manufacturing Energy Consumption Survey (MECS), which is conducted every four years by the Energy Information Administration of the Department of Energy. The MECS information was used rather than the ICCR information to account for the number of facilities with greater than 10 employees. Table A-66 shows the total number of manufacturing facilities using various fuel types. The first column on the table shows the total number of facilities reporting the use of the fuel. As some facilities use more than one fuel, summing the number of facilities across fuel types results in some overcounting of facilities. MECS does not contain information for wood waste combustion. The total number of facilities in the ICCR database reporting wood combustion was used instead.

The total number of facilities reporting any on-site energy generation is approximately 247,000 (U.S. DOE, 1997). The total number of facilities in SIC codes 20-39 with more than 10 employees is approximately 185,000 (U.S. Bureau of Census, 1995). This indicates that about 25 percent of the facilities reporting under MECS have fewer than 10 employees. Facilities with fewer than 10 employees are not required to report under EPCRA section 313. Therefore, the total number of facilities shown in the second column of Table A-66 have been reduced by 25 percent.

Since TRI reporting exempts fuel usage for employee personal use (e.g., heating, lighting, ventilation) and for motor vehicles from reporting threshold calculations, the number of facilities shown in Table A-66 have also been reduced by applying factors to account for non-process fuel usage. The percentage of process and non-process fuel use plus the total fuel use was obtained from MECS, and is shown in Table A-67.

TABLE A-66
NUMBER OF MANUFACTURING FACILITIES USING VARIOUS FUEL TYPES

Fuel Type	Total Number of Facilities	Estimated Number of Facilities with 10 or More Employees [a,b]	Process Use/Exempt Use Adjustment Factor	Estimated Number of Facilities Subject to Reporting for Combustion [c]
Coal	1,144	858	99%	849
Residual Oil	2,992	2,244	97%	2,177
Distillate Oil	35,920	26,940	68%	18,319
Wood Waste	1,405	1,054	n/a	1,054

a. Number of total facilities decreased by 25% to account for those with less than 10 employees.
b. U.S. EPA, 1998(f). U.S. DOE, 1997.
c. Due to rounding, calculations may not yield exact numbers.

TABLE A-67
MANUFACTURING FACILITY FUEL USE BY ACTIVITY

	Coal (1,000 tons)	Residual Oil (1,000 barrels)	Distillate Oil (1,000 barrels)
Total Fuel	54,143	70,111	26,107
Non-process Fuel	378	2,197	8,349
Percent Non-process	1%	3%	32%

Source: U.S. DOE, 1997.

Using the adjusted total number of facilities shown in Table A-66, and applying the percentages shown in Table A-65, the total number of facilities meeting the various thresholds was determined. Table A-68 shows the number of facilities exceeding the lower reporting thresholds for lead by fuel type. The total number of TRI reports expected at each threshold for lead associated with fuel combustion is provided at the bottom of the table.

TABLE A-68
NUMBER OF MANUFACTURING FACILITIES EXCEEDING THE LOWER REPORTING THRESHOLDS FOR LEAD

Fuel Type	Number of Facilities Exceeding Lower Reporting Thresholds (a)			
	1 lb	10 lbs	100 lbs	1,000 lbs
Coal	752	684	568	293
Residual Oil	1,572	917	140	4
Distillate Oil	8,119	3,121	300	14
Wood Waste	971	936	785	384
TOTAL	**11,414**	**5,658**	**1,793**	**695**
(a) Due to rounding, calculations may not yield exact numbers.				

SIC 4911, 4931, and 4939: Electric utilities

Coal- and oil-burning facilities in the following sectors engage in the generation, transmission, and distribution of electricity, gas, or steam and are subject to TRI reporting:

- Electric services (coal and oil facilities only) (SIC 4911),
- Electric and other services (coal and oil facilities only) (SIC 4931), and
- Combination utilities (coal and oil facilities only) (SIC 4939).

At the time of the economic analysis of the proposed rule, the number of facilities in SIC code 4911 currently reporting to TRI was not known. Therefore, the number of facilities estimated to report in the industry expansion economic analysis (514) were assumed to file a additional report for lead and lead compounds under the lead rule. The 514 facilities were estimated from a database of electric generating facilities from the Utility Data Institute (UDI). The UDI database contained facility-level financial and operational data for 514 coal- and oil-burning facilities.

For the final rule, the number of electric utility facilities potentially affected under the lead rule was defined as the number of facilities in SIC 4911 reporting to TRI in 1998 (564). Fuel throughput data, however, were not available for the 564 current reporters. Therefore, to identify the number of facilities expected to report under each option, the analysis used fuel- specific information available for the 514 facilities in UDI. In SIC code 4911, there were 390 coal-, and 124 oil-fired electric utility facilities for which fuel throughput data were available through UDI (U.S. EPA, 1997a) .

To determine the number of potentially affected facilities expected to report, the total pounds of lead manufactured at each of the 390 coal-, and 124 oil-fired facilities for which fuel throughput data were available was calculated using throughput information for *all* fuels combusted at each facility and the lead concentration data presented in Table A-62[5]. The total pounds of lead manufactured at each facility was used to determine the number of facilities exceeding each threshold. The percentage of facilities exceeding each threshold was calculated and applied to the 564 facilities identified in the 1998 TRI data to determine the number of potentially affected facilities exceeding each threshold. The number of facilities expected to submit a lead report under each option was calculated by subtracting the number of facilities in SIC 4911 that filed a TRI report for lead in 1998 from the number of potentially affected facilities exceeding each threshold.

Throughput data were not available for SIC codes 4931 and 4939. Therefore, the number of facilities in SIC 4931 and 4939 exceeding each reporting threshold is estimated by applying the percentage of facilities in SIC 4911 that exceed each threshold to the number of facilities in SIC 4931 and 4939 by fuel type. The number of facilities expected to submit a lead report under each option was calculated by subtracting the number of facilities in SIC 4931 and 4939 that filed a TRI report for lead in 1998 from the number of facilities exceeding each threshold. The total number of facilities in SIC 4911, 4931 and 4939 exceeding each threshold for lead is presented in Table A-69. In 1998, reporting for lead and lead compounds at the current thresholds included: 172 reports for SIC 4911, one report for SIC 4931, and one report for SIC 4939. This current reporting is reflected in Tables A-69 and A-71.

The universe of affected small municipalities under the rule is assumed to be a subset of the facilities in SIC code 4911 currently filing to TRI. The number of municipally-owned facilities in SIC code 4911 potentially subject to reporting under the proposed rule was determined using the UDI database of electric generating facilities. Of the 514 facilities in the UDI database, 49 were owned by municipalities. As TRI reporting data for facilities in SIC 4911 were not available at the time of the analysis, the municipally-owned facilities identified in the UDI database were assumed to represent the universe of municipal electric utility facilities potentially affected under the proposed lead.

As mentioned above, for the final rule, a total of 564 facilities from SIC code 4911 were identified as currently reporting from the 1998 TRI data (U.S. EPA, 1999). Of these, 13 are municipally-owned. It is assumed that the 13 facilities identified from the 1998 TRI data represent the universe of potentially affected municipally-owned facilities. The number of municipally-owned facilities expected to report under each option is estimated based on the methodology described above for SIC 4911. Of the 514 facilities for which fuel throughput data were available, 49 are municipally-owned. The total pounds of lead manufactured at each of the 49 facilities was calculated using throughput information for *all* fuels combusted at each facility and the lead concentration data presented in Table A-62. The percentage of municipally-owned

[5]Although facilities were grouped by primary fuel type, most facilities combust more than one fuel type. This approach accounts for lead manufactured due to the combustion of all fuel types at each facility.

facilities exceeding each threshold was calculated and applied to the 13 municipally-owned facilities identified in the 1998 TRI data to determine the number of potentially affected facilities exceeding each threshold. Using this methodology, nine municipally-owned facilities are expected to submit a report under the selected option.

TABLE A-69
TOTAL NUMBER OF FACILITIES IN SIC 4911, 4931, AND 4939 EXCEEDING LOWER THRESHOLDS

	# of 1998 filers exceeding threshold	**# of 1998 filers reporting for Pb**	**Total number of Pb reports**
SIC 4911			
1 lb	528	172	356
10 lbs	507	172	335
100 lbs	473	172	301
1,000 lbs	430	172	258
SIC 4931			
1 lb	276	1	275
10 lbs	265	1	264
100 lbs	247	1	246
1,000 lbs	225	1	224
SIC 4939			
1 lb	31	1	30
10 lbs	30	1	29
100 lbs	28	1	27
1,000 lbs	25	1	24

Note: The percent of facilities exceeding the final lead rule threshold for each fuel type is applied to the number of facilities burning that fuel in SIC codes 4931 and 4939 to estimate the number of facilities expected to report.

Summary of Estimated Reporting in Manufacturing Facilities and Electric Utilities Due to Combustion

Table A-70 summarizes the number of facilities expected to report at various thresholds for lead and lead compounds due to combustion. As shown, the expected number of reports decreases as the reporting threshold increases.

TABLE A-70
SUMMARY OF COMBUSTION-RELATED LEAD REPORTS AT LOWER THRESHOLDS FOR SIC 20-39, 4911, 4931, AND 4939

Number of Facilities in SIC 20-39, 4911, 4931, and 4939 Expected to Report for Lead at Each Threshold			
1 lb	**10 lbs**	**100 lbs**	**1,000 lbs**
12,075	6,286	2,367	1,201

A.3.3 SUMMARY OF ADDITIONAL REPORTS

Industries manufacturing, processing, or otherwise using lead and lead compounds that may submit TRI reports at the lower reporting thresholds are presented in Table A-71, along with the results of the analysis. The number of facilities reporting lead and lead compounds to TRI at current thresholds is also provided; these facilities have exceeded the current TRI reporting threshold criteria of 10,000 pounds per year for otherwise use, or the 25,000 pounds per year for either manufacture or process.

Lead and lead compounds were considered together since facilities can file a combined report if thresholds are exceeded for both the parent metals and compounds of that same metal. This analysis assumes that facilities exceeding lower thresholds for both lead and lead compounds will file a single report.

It is possible that some manufacturing facilities would be expected to submit a lead report as a result of both combustion and non-combustion activities. Therefore, it is necessary to adjust the total number of reports to avoid double-counting. As it is not possible to determine the extent of overlap between reporting due to combustion and non-combustion activities for each 4-digit SIC code, this adjustment is made by subtracting the number of reports resulting from combustion from the number of non-combustion related reports (i.e., this analysis is assuming that every facility reporting lead due to combustion activities is also reporting lead due to non-combustion activities). If the number of reports resulting from combustion exceeds the number of non-combustion related reports for a given two-digit SIC code, it is assumed that all facilities submitting a report for non-combustion activities would also be expected to submit a report as a result of combustion. In such cases, the number of reports resulting from non-combustion activities is subtracted. Table A-72 presents the expected number of lead reports due to combustion and non-combustion activities; the table also presents an adjustment number to account for the overlap of reports due to both activities. This adjustment number is applied to the total number of reports in Table A-71.

After adjusting the total number of reports to avoid double-counting, an additional 21,587, 14,612, 9,813, and 4,960 facilities are estimated to submit TRI reports for lead and lead compounds at the 1-, 10-, 100-, and 1,000-pound thresholds, respectively.

TABLE A-71
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD AND LEAD COMPOUNDS

SIC Code	Industry Sector	Total number of facilities with 10 or more FTEs	Number of facilities reporting lead/lead compounds at current thresholds	Number of additional facilities submitting reports			
				Greater than 1 lb	Greater than 10 lbs	Greater than 100 lbs	Greater than 1,000 lbs
1021	Copper ores	34	12	22	22	22	22
1031	Lead and zinc ores	23	15	8	8	8	8
1041	Gold ores	108	11	97	97	97	97
12	Coal mining	321	7	314	314	314	314
2047	Dog and cat food	132	0	132	132	48	0
2048	Prepared feeds, n.e.c.	978	0	978	978	137	0
2611	Pulp mills	48	1	47	47	28	0
2816	Inorganic pigments	25	16	9	9	9	9
28197	Inorganic Potassium and sodium compounds, n.e.c. [a]	37	2	35	35	35	35
2821	Plastics materials synthetic resins, and nonvulcanizable elastomers	440	6	280	280	125	7
2873	Nitrogenous fertilizers, except organics	71	1	70	70	70	70
28733	Organic fertilizers	19	0	19	19	19	14
2874	Phosphatic fertilizers	48	1	47	47	47	33
2875	Fertilizers, mixing only	194	2	192	192	192	192
2911	Petroleum refining	127	32	95	95	95	94
2951	Asphalt paving mixtures	942	0	942	26	0	0
3229	Pressed and blown glassware, n.e.c.	181	21	25	25	5	1

TABLE A-71, CONT'D.
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD AND LEAD COMPOUNDS

SIC Code	Industry Sector	Total number of facilities with 10 or more FTEs	Number of facilities reporting lead/lead compounds at current thresholds	Number of additional facilities submitting reports: Greater than 1 lb	Greater than 10 lbs	Greater than 100 lbs	Greater than 1,000 lbs
3231821	Stained glass [b]	64	0	64	64	64	64
3241	Cement, hydraulic	136	25	111	111	111	111
3261	Vitreous plumbing fixtures	43	0	25	25	6	1
3312	Blast furnaces and steel mills	271	97	174	174	174	174
3313	Electrometallurgical products (ferroalloys)	29	3	26	26	17	1
3315	Steel wiredrawing and steel nails and spikes	237	27	210	210	123	0
3321	Gray/ductile iron foundries	492	21	471	471	471	471
3322	Malleable iron foundries	15	2	13	13	13	13
3324	Steel investment foundries	124	0	124	124	112	20
3325	Steel foundries, n.e.c.	225	6	219	219	219	70
3331	Primary copper smelting	6	9	0	0	0	0
3334	Primary Production of aluminum	33	3	30	30	20	20
3339	Primary smelting of nonferrous metals, except copper and aluminum	2	9	0	0	0	0
3341	Secondary smelting of nonferrous metals	75	65	10	10	10	0
3351	Copper rolling and drawing (brass and bronze)	100	18	82	82	82	82
3353	Aluminum sheet plate and foil	59	3	56	56	56	44
3354	Aluminum extruded products	158	6	152	152	152	110
3363	Aluminum Die-casting	255	9	246	246	246	23

TABLE A-71, CONT'D.
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD AND LEAD COMPOUNDS

SIC Code	Industry Sector	Total number of facilities with 10 or more FTEs	Number of facilities reporting lead/lead compounds at current thresholds	Number of additional facilities submitting reports			
				Greater than 1 lb	Greater than 10 lbs	Greater than 100 lbs	Greater than 1,000 lbs
3365	Aluminum foundries	376	7	369	369	250	16
3471	Electroplating, plating, polishing, anodizing, and coloring	1,763	20	408	333	157	83
3479	Galvanizing (part of SIC 3471, Metal coating, engraving and allied services) [c]	120	27	93	93	93	93
3482	Small arms ammunition	32	15	17	17	17	17
3671	Electron Tubes	109	10	99	99	99	25
3672	Printed Circuit Boards	924	26	898	898	898	351
3674	Semiconductors and related devices	613	5	608	608	608	236
3675	Electronic Capacitors	95	1	94	94	94	55
3676	Electronic Resistors	85	1	84	74	30	0
3677	Electronic Coils and Transformers	299	0	299	299	299	128
3678	Electronic Connectors	216	1	215	215	215	215
3679	Electronic Components, n.e.c	1,716	33	1,683	1,683	1,230	445
3691	Storage battery manufacturing	98	70	28	28	28	28
371	Motor vehicles and motor vehicle equipment	2,949	102	347	347	347	0
39312	Organ manufacturing	30	0	30	30	30	30
4911	Electric services (coal and oil facilities only)	564	172	356	335	301	258

TABLE A-71, CONT'D.
ESTIMATED NUMBER OF ADDITIONAL REPORTS FOR LEAD AND LEAD COMPOUNDS

SIC Code	Industry Sector	Total number of facilities with 10 or more FTEs	Number of facilities reporting lead/lead compounds at current thresholds	Number of additional facilities submitting reports			
				Greater than 1 lb	Greater than 10 lbs	Greater than 100 lbs	Greater than 1,000 lbs
4931	Electric and other services (coal and oil facilities only)	295	1	275	264	246	224
4939	Combination utilities (coal and oil facilities only)	33	1	30	29	27	24
4953	Refuse systems	162	55	107	107	107	107
5171	Bulk petroleum	3,842	5	2,454	975	616	50
7389	Solvent recovery services	191	2	108	96	78	40
20-39	Coal-fired industrial sources	849	unknown	752	684	568	293
20-39	Oil-fired industrial sources	20,496	unknown	9,691	4,038	440	18
20-39	Wood-fired industrial sources	1,054	unknown	971	936	785	384
Subtotal		42,963	984	25,341	17,060	10,690	5,220
Adjustment for double-counting (see Table A-72)		na	0	3,754	2,448	877	260
TOTAL		**42,963**	**984**	**21,587**	**14,612**	**9,813**	**4,960**

a. 27 reports submitted in 1998 for all of SIC 2819; it was estimated 2 of these were from 28197.
b. 14 reports submitted in 1998 for all of SIC 3231; it was assumed none of these were from stained glass facilities.
c. 37 reports submitted in 1998 for all of SIC 3479; it was estimated that 27 of these were from galvanizing facilities.

TABLE A-72
COMBUSTION FACILITIES AND ADJUSTED FACILITY ESTIMATES BY SIC CODE

SIC Code	Total Number of Facilities Reporting due to Combustion				Total Number of Facilities Otherwise Reporting [a]				Combustion Facility Adjustment [b]			
	>1 lb	>10 lbs	>100 lbs	>1,000 lbs	>1 lb	>10 lbs	>100 lbs	>1,000 lbs	>1 lb	>10 lbs	>100 lbs	>1,000 lbs
20	1,337	742	291	120	1,110	1,110	185	0	1,110	742	185	0
21	66	48	29	14	0	0	0	0	0	0	0	0
22	582	382	184	79	0	0	0	0	0	0	0	0
23	218	91	16	4	0	0	0	0	0	0	0	0
24	2,167	860	107	17	0	0	0	0	0	0	0	0
25	221	127	60	28	0	0	0	0	0	0	0	0
26	637	416	211	94	47	47	28	0	47	47	28	0
27	489	212	41	11	0	0	0	0	0	0	0	0
28	945	506	188	77	652	652	497	360	652	506	188	77
29	286	150	50	19	1,037	121	95	94	286	121	50	19
30	426	233	84	33	0	0	0	0	0	0	0	0
31	70	43	18	7	0	0	0	0	0	0	0	0
32	1,083	519	171	71	225	225	186	177	225	225	171	71
33	417	213	77	32	2,182	2,182	1,945	1,044	417	213	77	32
34	764	337	79	27	518	443	267	193	518	337	79	27
35	709	301	53	14	0	0	0	0	0	0	0	0
36	226	110	32	12	4,008	3,998	3,501	1,483	226	110	32	12
37	243	117	37	14	347	347	347	0	243	117	37	0
38	196	75	7	0	0	0	0	0	0	0	0	0
39	332	176	58	22	30	30	30	30	30	30	30	22
Total [c]	**11,414**	**5,658**	**1,793**	**695**	**10,156**	**9,155**	**7,081**	**3,381**	**3,754**	**2,448**	**877**	**260**

a. Number of facilities expected to report for an activity other than combustion.
b. Number of facilities to be backed out of total at the two-digit SIC code level to avoid double-counting of facilities expected to report due to combustion and another activity.
c. Totals may not exactly match the sum of each SIC code level due to rounding.

A.3.4 OTHER INDUSTRIES THAT MAY BE AFFECTED BY THE FINAL LEAD RULE

Due to a lack of data on lead consumption or emissions at the facility and sector level, this analysis did not estimate the number of additional lead reports to TRI at the lower thresholds for every industry group that may be affected by the final rule. In 1998, 39 four-digit SIC codes (excluding those listed in Table A-71) each had more than five facilities reporting lead or lead compounds to TRI at the current thresholds. This may indicate that additional facilities in these SIC codes use lead or lead compounds at levels below current thresholds but above the final lead rule thresholds, resulting in additional reporting at the lower thresholds. The SIC codes listed in Table A-73 may also be affected by the final lead rule.

In addition, SIC 3443 (Fabricated plate work) was added based on lead consumption data from the U.S. Geological Survey, and SIC 5169 (Chemicals and allied products, n.e.c.), a TRI expansion industry, was added to the table because of the sector's potential for processing chemical products that contain lead as a trace constituent. SIC codes 3211 (flat glass), 3221 (glass containers), and 3253 (ceramic wall and floor tile) were added due to the use of lead borosilicate enamels in these SIC codes.

Also, commenters indicated that several other industries might be affected by the lower reporting thresholds. However, sufficient information was not provided to estimate the number of reports expected at the lower thresholds and EPA was unable to identify information to support these assertions. These industries include:

- ceramic and glass decorators
- medical and dental equipment manufacturers
- manufacturers of sporting and recreational equipment
- ink formulators
- manufacturers of musical instruments
- metalworking facilities
- brass and copper fabricators
- dye makers and manufacturers of dye-containing products
- precision metal components
- stabilizers
- printing facilities
- packaging or packaging coating firms

TABLE A-73
OTHER INDUSTRIES THAT MAY BE AFFECTED BY THE FINAL LEAD RULE

SIC Code	Industry Sector	Number of TRI Facilities (1998)	1998 TRI Total Air Emissions (pounds)	1998 TRI Total Section 8 Quantities (pounds)	Potential Sources and Miscellaneous Comments
2819	Industrial inorganic chemicals, n.e.c.	27	4,398	4,855,176	Lead oxide and lead salt manufacturing; lead analytical reagents
2821	Plastics materials, synthetic resins, and nonvulcanizable elastomers	6	50	2,215	Lead-based heat stabilizers for PVC and other plastics. Facilities in this SIC code using antimony trioxide have been included in the estimate of additional reports.
2851	Paints, varnishes, lacquers, enamels, and allied products	51	3,631	194,877	Lead drying agents and other additives. An order-of-magnitude estimate of 100 facilities would report at the 1-pound threshold (NPCA, 1999; U.S. EPA, 1998d; U.S. Bureau of the Census, 1996b).
2869	Industrial organic chemicals, n.e.c.	18	4,199	113,077	Lead catalysts and analytical reagents
2899	Chemicals and chemical preparations, n.e.c.	10	1,182	74,926	Lead oxides in frit manufacturing
3052	Rubber and plastics hose and belting	10	775	236,266	Lead pigments, fillers, activators, vulcanizers, curing additives, and plasticizers
3069	Fabricated rubber products, n.e.c.	13	53	99,021	Lead pigments, fillers, activators, vulcanizers, curing additives, and plasticizers
3081	Unsupported plastics film and sheet	10	48	21,248	Lead-based heat stabilizers for PVC and other plastics
3087	Custom compounding of purchased plastics resins	50	15,849	149,858	Lead-based heat stabilizers for PVC and other plastics
3089	Plastics products, n.e.c.	14	2,206	885,627	Lead-based heat stabilizers for PVC and other plastics

TABLE A-73, CONT'D.
OTHER INDUSTRIES THAT MAY BE AFFECTED BY THE FINAL LEAD RULE

SIC Code	Industry Sector	Number of TRI Facilities (1998)	1998 TRI Total Air Emissions (pounds)	1998 TRI Total Section 8 Quantities (pounds)	Potential Sources and Miscellaneous Comments
3211	Flat glass	4	0	9,153	Lead components, including lead hydroxide, lead silicates, and litharge. Facilities in SIC codes 3229 using antimony trioxide have been included in the estimate of additional reports. Facilities in SIC code 3231 manufacturing stained glass windows have been included in the estimate of additional reports. In SIC Code 3269, lead oxides are found in frit manufacturing. There are also lead components in glazes. According to the Society of Ceramic and Glass Decorators, lead use by facilities using lead borosilicate enamels to decorate ceramic and glass products approximates the following (Society of Ceramic and Glass Decorators, 2000): 10 facilities use 4,000 to 80,000 lbs lead/year 100 to 200 facilities use 400 to 4,000 lbs lead/year 50 to 100 facilities use 0 to 1,000 lbs lead/year
3221	Glass containers	0	0	0	
3229	Pressed and blown glass and glassware, n.e.c.	21	38,257	98,503,750	
3231	Glass products, made of purchased glass	14	3,500	167,888	
3253	Ceramic wall and floor tile	0	0	0	
3269	Pottery products, n.e.c.	6	1,178	177,243	
3316	Cold-rolled steel sheet, strip, and bars	15	277	261,060	
3317	Steel pipe and tubes	6	1,984	151,618	
3356	Rolling, drawing, and extruding of nonferrous metals, except copper and aluminum	17	3,454	2,867,042	Lead and lead alloy products, lead alloyed with other metal products
3357	Drawing and insulating of nonferrous wire	94	26,041	3,895,880	Lead in cable coverings
3366	Copper foundries	36	32,656	2,150,977	Lead incorporated into brass and bronze products
3369	Nonferrous foundries, except copper and aluminum	26	7,887	646,235	
3399	Primary metal products, n.e.c.	15	2,059	3,643,251	
3429	Hardware, n.e.c.	9	37	228,262	
3432	Plumbing fixture fittings and trim	17	3,893	2,243,754	Lead incorporated into plumbing products, lead in solder
3441	Fabricated structural metal	12	0	101,870	Lead in solder

TABLE A-73, CONT'D.
OTHER INDUSTRIES THAT MAY BE AFFECTED BY THE FINAL LEAD RULE

SIC Code	Industry Sector	Number of TRI Facilities (1998)	1998 TRI Total Air Emissions (pounds)	1998 TRI Total Section 8 Quantities (pounds)	Potential Sources and Miscellaneous Comments
3443	Fabricated plate work (boiler shops)	1	7	87	Sheet lead, lead pipes and other extruded products, nuclear radiation shielding using lead.
3451	Screw machine products	15	4	1,734,202	
3469	Metal stampings, n.e.c.	4	510	3,588	
3479	Coating, engraving, and allied services, n.e.c.	37	1,010	412,071	Galvanizing facilities included in this SIC code have been included in the estimate of additional reports.
3494	Valves and pipe fittings, n.e.c.	28	2,574	1,778,271	Lead in solder
3496	Miscellaneous fabricated wire products	6	7	58,972	Lead in cable coverings
3499	Fabricated metal products, n.e.c.	36	14,890	6,866,688	Lead in solder
3559	Special industry machinery, n.e.c.	7	13	87,357	Lead in solder
3585	Air-conditioning and warm air heating equipment and commercial and industrial refrigeration equipment	7	1,546	83,512	
3641	Electric lamp bulbs and tubes	17	7,548	2,031,529	Lead in fluorescent lamps
3643	Current-carrying wiring devices	13	33,949	65,239	
3661	Telephone and telegraph apparatus	8	23	261,452	
3694	Electrical equipment for internal combustion engines	6	879	88,341	Lead in cable coverings
5169	Chemical and allied products – wholesale trade	6	5	70	Lead as a trace constituent in chemical products

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APPENDIX B
REVENUE DECILES AND COST IMPACT PERCENTAGES FOR LARGE COMPANIES

TABLE B-1
LARGE COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES									
		1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	140,165,496	290,799,872	491,900,416	961,916,928	1,254,849,920	1,475,793,920	1,999,899,904	3,033,523,840	4,989,148,416	25,571,497,984
	New Filer	27,582,672	77,138,496	160,115,496	294,711,424	451,345,920	1,057,416,448	1,664,944,384	2,283,749,888	4,093,649,920	7,175,759,872
12	Current Filer	7,750,000	25,500,000	94,800,000	181,700,000	327,489,408	1,190,849,920	2,173,449,984	5,095,798,784	8,264,300,544	17,347,999,744
	New Filer	7,750,000	25,500,000	94,800,000	181,700,000	327,489,408	1,190,849,920	2,173,449,984	5,095,798,784	8,264,300,544	17,347,999,744
20	Current Filer	76,900,000	150,000,000	214,700,000	358,148,352	545,206,912	945,966,848	1,445,904,896	3,861,518,848	9,381,502,976	17,056,997,376
	New Filer	22,000,000	50,550,000	97,300,000	150,000,000	218,433,000	337,547,500	548,314,000	1,381,566,000	4,004,237,000	10,213,700,000
21	Current Filer	171,400,000	225,000,000	389,615,000	1,423,246,000	1,533,300,000	1,769,500,000	2,171,803,000	4,287,204,000	20,138,800,000	72,055,000,000
	New Filer	171,400,000	225,000,000	389,615,000	1,423,246,000	1,533,300,000	1,769,500,000	2,171,803,000	4,287,204,000	20,138,800,000	72,055,000,000
22	Current Filer	84,800,000	145,348,992	200,000,000	244,288,992	476,448,000	902,650,880	1,300,000,000	2,170,299,904	9,152,999,424	12,626,296,832
	New Filer	39,016,500	60,137,500	86,550,000	125,000,000	189,235,000	248,099,500	479,047,500	1,024,737,000	2,774,200,000	7,426,450,000
23	Current Filer	20,000,000	30,833,000	44,000,000	60,200,000	92,800,000	149,619,000	256,146,000	484,832,000	1,509,841,000	6,058,602,000
	New Filer	20,000,000	30,833,000	43,600,000	60,000,000	91,059,500	146,000,000	254,775,000	479,816,000	1,470,935,000	5,172,456,000
24	Current Filer	40,000,000	94,252,576	140,000,000	200,000,000	326,077,824	433,432,320	1,100,000,000	1,710,999,808	3,760,000,000	6,162,120,704
	New Filer	20,679,000	39,000,000	58,385,500	96,578,500	145,601,500	240,055,500	485,827,000	1,040,895,500	2,269,502,500	4,795,124,000
25	Current Filer	44,300,000	58,736,608	89,100,000	150,000,000	185,814,000	258,194,000	519,599,872	1,017,475,840	2,000,999,936	2,909,199,872
	New Filer	31,692,000	50,000,000	83,616,000	109,805,000	165,943,000	270,000,000	496,268,000	980,135,000	2,180,497,000	3,900,000,000
26	Current Filer	128,284,992	187,171,072	320,162,816	467,535,872	610,104,832	936,854,784	1,830,321,920	2,567,599,872	6,400,000,000	12,546,596,864
	New Filer	50,000,000	90,000,000	135,821,000	200,000,000	341,307,000	550,000,000	933,151,000	1,615,274,000	4,476,761,000	8,014,000,000
27	Current Filer	40,300,000	80,087,488	130,000,000	415,385,856	797,319,936	1,110,999,808	1,877,236,992	3,534,094,848	5,018,435,584	8,494,596,096
	New Filer	15,522,500	37,853,000	65,684,000	113,471,000	201,275,000	398,937,500	717,865,500	1,458,071,500	4,624,550,000	13,299,500,000
28	Current Filer	73,076,000	164,600,000	286,822,144	457,239,808	770,578,432	1,300,000,000	1,896,699,904	3,700,281,856	8,835,461,120	15,127,998,464
	New Filer	39,800,000	102,884,000	185,200,000	300,000,000	481,345,500	851,967,000	1,447,990,000	2,417,470,000	6,846,881,000	13,094,000,000
29	Current Filer	62,700,000	268,178,000	347,799,808	851,966,976	1,629,301,888	3,176,118,784	6,063,996,928	9,999,998,976	17,180,598,272	40,582,995,968
	New Filer	28,000,000	48,768,000	100,000,000	243,000,000	533,898,500	1,219,700,000	2,298,173,000	4,409,600,000	12,626,300,000	20,000,000,000

TABLE B-1, CONT'D.
LARGE COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES 1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
30	Current Filer	58,000,000	113,800,000	186,393,328	287,065,856	488,499,456	751,557,888	1,164,032,000	2,042,059,776	4,658,499,584	12,311,298,048
	New Filer	46,200,000	75,000,000	106,000,000	154,500,000	215,000,000	380,000,000	686,400,000	1,400,000,000	3,760,000,000	8,494,600,000
31	Current Filer	100,000,000	142,000,000	152,000,000	233,000,000	346,441,472	439,786,752	536,106,752	694,630,912	3,309,999,872	6,058,598,400
	New Filer	53,922,000	77,350,000	135,000,000	183,489,000	261,981,000	505,658,500	807,000,000	1,894,659,000	6,624,000,000	15,128,000,000
32	Current Filer	80,000,000	155,115,496	250,000,000	441,326,336	649,999,872	915,954,944	1,479,699,968	1,898,349,952	4,372,996,096	13,319,196,672
	New Filer	25,000,000	49,050,000	88,100,000	140,000,000	214,610,500	378,454,000	690,076,000	1,387,698,000	3,572,100,000	7,268,500,000
33	Current Filer	72,700,000	151,430,992	228,000,000	349,999,872	557,943,808	720,987,904	1,147,054,848	2,020,373,760	4,999,999,488	10,436,059,136
	New Filer	55,100,000	112,064,000	200,000,000	299,350,000	511,813,500	690,131,000	1,147,055,000	1,899,800,000	5,745,235,000	10,647,590,000
34	Current Filer	55,000,000	94,806,000	157,457,728	214,876,992	322,025,856	558,769,920	887,200,000	1,672,899,840	4,596,989,952	8,818,597,888
	New Filer	29,452,000	55,400,000	86,250,000	139,681,500	201,931,500	319,600,500	562,220,500	1,134,314,500	3,364,706,000	7,510,000,000
35	Current Filer	73,600,000	150,000,000	238,166,992	349,999,872	571,587,840	965,748,992	1,678,387,968	3,309,999,872	6,805,889,024	13,821,497,344
	New Filer	30,200,000	61,719,000	100,878,000	156,222,500	221,886,000	369,890,500	653,397,500	1,308,350,000	3,920,500,000	8,027,500,000
36	Current Filer	74,973,088	145,935,568	213,878,000	335,963,904	500,000,000	826,358,784	1,460,804,864	2,980,000,000	8,459,997,184	15,020,998,656
	New Filer	32,000,000	69,166,000	110,469,000	167,745,000	266,270,000	449,506,000	738,897,000	1,348,703,000	4,069,290,000	10,062,000,000
37	Current Filer	77,970,000	151,700,000	248,000,000	391,055,872	616,099,840	1,000,000,000	1,539,099,904	3,460,399,872	7,596,998,656	13,319,196,672
	New Filer	42,800,000	83,596,000	140,000,000	191,789,500	303,048,000	504,203,000	900,000,000	1,686,852,000	4,844,500,000	8,500,000,000
38	Current Filer	93,000,000	150,062,656	266,400,000	426,913,792	774,658,560	1,328,199,936	2,149,473,792	8,459,997,184	14,196,023,296	18,165,997,568
	New Filer	30,000,000	71,754,000	115,753,000	171,935,000	248,602,000	412,292,500	784,095,000	1,695,062,500	5,628,663,000	10,647,590,000
39	Current Filer	60,800,880	93,000,000	133,750,976	185,100,000	295,702,784	500,000,000	842,926,848	1,900,000,000	3,900,000,000	5,288,796,160
	New Filer	22,600,000	39,000,000	75,000,000	114,400,000	166,502,500	261,981,000	496,268,000	1,021,000,000	3,188,559,000	6,624,000,000
4911	Current Filer	133,200,000	447,593,344	729,892,864	1,003,018,880	1,480,802,816	2,267,795,456	3,358,099,968	5,134,497,792	7,945,605,120	12,610,998,272
	New Filer	96,156,992	301,527,040	538,108,928	918,069,760	1,472,753,408	2,166,099,968	3,826,372,864	5,481,996,288	9,561,718,784	13,504,770,048
4931	Current Filer	7,600,000	12,500,000	19,421,664	40,000,000	97,149,496	663,242,752	1,789,601,792	3,326,542,848	5,481,996,288	9,234,997,248
	New Filer	7,600,000	13,102,989	19,588,320	40,000,000	97,310,184	955,699,968	2,151,764,992	3,342,524,928	5,481,996,288	9,234,997,248

TABLE B-1, CONT'D.
LARGE COMPANY-LEVEL REVENUES BY DECILE

SIC Code		REVENUES 1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4939	Current Filer	6,532,241	9,600,000	21,125,968	63,039,728	176,252,128	365,123,840	1,749,724,928	3,377,299,968	8,926,298,112	16,308,899,840
	New Filer	6,285,021	9,133,926	19,412,984	47,569,352	172,995,064	399,180,416	2,168,132,864	3,606,052,864	11,152,338,944	16,308,899,840
4953	Current Filer	9,245,000	16,500,000	24,000,000	31,569,384	40,726,864	76,146,848	175,000,000	226,139,000	2,187,401,984	3,234,579,968
	New Filer	7,000,000	8,000,000	9,500,000	11,374,065	15,800,000	25,000,000	44,284,608	146,375,152	944,237,824	3,558,319,872
5171	Current Filer	33,000,000	100,000,000	216,272,480	904,000,000	1,696,527,360	4,781,395,968	9,234,997,248	15,424,000,000	40,582,995,968	51,404,996,608
	New Filer	20,000,000	28,000,000	35,884,544	48,600,000	64,327,696	103,853,152	198,000,000	1,116,224,000	8,582,995,968	17,180,598,272

TABLE B-2a
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	2.25	$11,668	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.84	$21,766	0.08%	0.03%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	Current Filer	4.48	$23,206	0.30%	0.09%	0.05%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.35	$33,385	0.43%	0.13%	0.04%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
20	Current Filer	4.80	$24,906	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	6.78	$52,069	0.24%	0.10%	0.05%	0.03%	0.02%	0.02%	0.01%	0.00%	0.00%	0.00%
21	Current Filer	5.53	$28,674	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	5.00	$38,374	0.02%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
22	Current Filer	1.81	$9,370	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.75	$28,791	0.07%	0.05%	0.03%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
23	Current Filer	3.38	$17,524	0.09%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
	New Filer	3.38	$25,960	0.13%	0.08%	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
24	Current Filer	4.19	$21,733	0.05%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.58	$27,492	0.13%	0.07%	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
25	Current Filer	2.65	$13,751	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.41	$26,188	0.08%	0.05%	0.03%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
26	Current Filer	3.09	$16,004	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	6.42	$49,303	0.10%	0.05%	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
27	Current Filer	1.08	$11,767	0.03%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.15	$42,011	0.27%	0.11%	0.06%	0.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
28	Current Filer	4.21	$21,814	0.03%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.24	$32,541	0.08%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
29	Current Filer	2.85	$14,798	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.94	$22,598	0.08%	0.05%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	Current Filer	2.53	$13,121	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.41	$26,196	0.06%	0.03%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%

TABLE B-2a, CONT'D.
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
31	Current Filer	2.14	$11,078	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.63	$20,197	0.04%	0.03%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
32	Current Filer	3.23	$16,772	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	5.00	$38,409	0.15%	0.08%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%
33	Current Filer	2.66	$13,803	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.77	$21,294	0.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
34	Current Filer	2.43	$12,624	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.07	$23,551	0.08%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
35	Current Filer	2.52	$13,090	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.20	$24,591	0.08%	0.04%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
36	Current Filer	2.68	$13,885	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.77	$28,963	0.09%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
37	Current Filer	3.33	$17,272	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.86	$29,656	0.07%	0.04%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
38	Current Filer	1.72	$8,917	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.27	$25,064	0.08%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
39	Current Filer	1.45	$7,514	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.07	$15,870	0.07%	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
4911	Current Filer	3.85	$19,950	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	11.89	$91,266	0.09%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
4931	Current Filer	2.59	$13,453	0.18%	0.11%	0.07%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.58	$19,789	0.26%	0.15%	0.10%	0.05%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%
4939	Current Filer	1.69	$8,744	0.13%	0.09%	0.04%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.66	$12,740	0.20%	0.14%	0.07%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%

TABLE B-2a, CONT'D.
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - FIRST YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	First Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4953	Current Filer	2.06	$10,668	0.12%	0.06%	0.04%	0.03%	0.03%	0.01%	0.01%	0.00%	0.00%	0.00%
	New Filer	4.96	$38,049	0.27%	0.16%	0.10%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%
5171	Current Filer	5.22	$27,091	0.08%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.66	$12,768	0.06%	0.05%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%

Note: No first-time filers are estimated in the following SIC codes: 12, 25, 27, 28, 29, 30, 31, 34, 35, 37, 38, 4911, 4931 4939, 4953, 5171.

TABLE B-2b
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	Subse-quent Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
10	Current Filer	2.25	$8,062	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.84	$10,163	0.04%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
12	Current Filer	4.48	$16,035	0.21%	0.06%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.35	$15,587	0.20%	0.06%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
20	Current Filer	4.80	$17,210	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	6.78	$24,311	0.11%	0.05%	0.02%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
21	Current Filer	5.53	$19,814	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	5.00	$17,917	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
22	Current Filer	1.81	$6,474	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.75	$13,443	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
23	Current Filer	3.38	$12,109	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.38	$12,121	0.06%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
24	Current Filer	4.19	$15,018	0.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.58	$12,836	0.06%	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%
25	Current Filer	2.65	$9,502	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.41	$12,227	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
26	Current Filer	3.09	$11,059	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	6.42	$23,020	0.05%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
27	Current Filer	1.08	$8,131	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.15	$19,615	0.13%	0.05%	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
28	Current Filer	4.21	$15,074	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.24	$15,193	0.04%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
29	Current Filer	2.85	$10,226	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.94	$10,551	0.04%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	Current Filer	2.53	$9,067	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.41	$12,231	0.03%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%

TABLE B-2b, CONT'D.
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	Subse-quent Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
31	Current Filer	2.14	$7,655	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.63	$9,430	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
32	Current Filer	3.23	$11,590	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	5.00	$17,933	0.07%	0.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
33	Current Filer	2.66	$9,538	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.77	$9,942	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
34	Current Filer	2.43	$8,723	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.07	$10,996	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
35	Current Filer	2.52	$9,045	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.20	$11,482	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
36	Current Filer	2.68	$9,594	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.77	$13,523	0.04%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
37	Current Filer	3.33	$11,935	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.86	$13,846	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
38	Current Filer	1.72	$6,162	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	3.27	$11,702	0.04%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
39	Current Filer	1.45	$5,192	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.07	$7,410	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
4911	Current Filer	3.85	$13,785	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	11.89	$42,612	0.04%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
4931	Current Filer	2.59	$9,296	0.12%	0.07%	0.05%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	2.58	$9,239	0.12%	0.07%	0.05%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
4939	Current Filer	1.69	$6,042	0.09%	0.06%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.66	$5,948	0.09%	0.07%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

TABLE B-2b, CONT'D.
COMPANY-LEVEL COST IMPACT PERCENTAGES
SELECTED OPTION - SUBSEQUENT YEAR IMPACTS FOR LARGE COMPANIES

SIC Code		Avg. # of Facilities per Company	Subsequent Yr. Costs	1st Decile	2nd Decile	3rd Decile	4th Decile	5th Decile	6th Decile	7th Decile	8th Decile	9th Decile	10th Decile
4953	Current Filer	2.06	$7,371	0.08%	0.04%	0.03%	0.02%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%
	New Filer	4.96	$17,765	0.13%	0.08%	0.05%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
5171	Current Filer	5.22	$18,720	0.06%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	New Filer	1.66	$5,961	0.03%	0.02%	0.02%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%

Note: No first-time filers are estimated in the following SIC codes: 12, 25, 27, 28, 29, 30, 31, 34, 35, 37, 38, 4911, 4931 4939, 4953, 5171.